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TITLE 6—AGRICULTURAL CREDIT

Chapter I—Farm Credit Administration, Department of Agriculture

Subchapter F—Banks for Cooperatives
[Order No. 478]

PART 70—LOAN INTEREST RATES AND SECURITY

INTEREST RATE ON LOANS

Sections 70.90, 70.90-50, and 70.90-51 of Title 6 of the Code of Federal Regulations are hereby amended to read as follows:

§ 70.90 *Interest rate on continental loans for financing operations.* The per annum rate of interest on all loans, other than upon the security of commodities, made on and after the dates stated below, by the district banks for cooperatives, for the purposes specified in section 7 (a) (1) of the Agricultural Marketing Act, as amended (sec. 7, 46 Stat. 14; 12 U. S. C. 1141e), shall be as follows:

Rate (per cent)	Effective date	District bank for cooperatives
2 1/4	Feb. 24, 1939	Louisville and Omaha.
2 3/4	Dec. 1, 1947	St. Louis.
3	Feb. 1, 1948	Spokane.
3	Mar. 1, 1948	New Orleans and Houston.
3	Apr. 1, 1948	Springfield, Baltimore, Columbia, Wichita, and Berkeley.
3	May 1, 1948	St. Paul.

§ 70.90-50 *Interest rate on continental commodity loans.* Except as specified in § 70.90-51, the per annum rate of interest on all loans made upon the security of commodities on and after the dates stated below by the district banks for cooperatives for the purposes specified in section 7 (a) (1) of the Agricultural Marketing Act, as amended (sec. 7, 46 Stat. 14; 12 U. S. C. 1141e), shall be as follows:

Rate (per cent)	Effective date	District bank for cooperatives
1 1/4	Feb. 24, 1939	Louisville and Omaha.
1 3/4	Dec. 1, 1947	St. Louis.
2	Feb. 1, 1948	Spokane.
2	Mar. 1, 1948	New Orleans and Houston.
2	Apr. 1, 1948	Springfield, Baltimore, Columbia, Wichita and Berkeley.
2	May 1, 1948	St. Paul.

§ 70.90-51 *Interest rate on continental loans and loans made in Puerto Rico secured by Commodity Credit Corporation loan documents.* The rate of interest on loans made on and after the dates stated below, by the district banks for cooperatives upon the security of approved Commodity Credit Corporation loan documents, shall be as follows:

Rate (per cent)	Effective date	District bank for cooperatives
1 1/4	June 30, 1947	Louisville and Omaha.
1 3/4	Dec. 1, 1947	St. Louis.
2	Feb. 1, 1948	Spokane.
2	Mar. 1, 1948	New Orleans and Houston.
2	Apr. 1, 1948	Springfield, Baltimore, Columbia, Wichita and Berkeley.
2	May 1, 1948	St. Paul.
2 1/4	Apr. 1, 1948	Baltimore—Loans in Puerto Rico.

(Sec. 8, 46 Stat. 14, as amended; 12 U. S. C. 1141f)

[SEAL]

I. W. DUGGAN,
Governor.

MARCH 25, 1948.

[F. R. Doc. 48-2859; Filed, Mar. 30, 1948; 8:51 a. m.]

TITLE 7—AGRICULTURE

Chapter IX—Production and Marketing Administration (Marketing Agreements and Orders)

PART 965—MILK IN THE CINCINNATI, OHIO, MILK MARKETING AREA

ORDER SUSPENDING CERTAIN PROVISIONS

Pursuant to the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U. S. C. 601 et seq.), hereinafter referred to as the "act," and of the order, as amended, regulating the handling of milk in the Cincinnati, Ohio, milk marketing area, hereinafter referred to as the "order," it is hereby found and determined that:

(a) The provisions of the order "\$1.05 for the delivery periods of April through July and * * * for the delivery periods of August through March" appearing in § 965.6 (a) (1) and the provisions "\$0.60 for the delivery periods of April through July and * * * for the delivery periods of August through March" appearing in § 965.6 (a) (2) do not tend

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FEDERAL REGISTER

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to effectuate the declared policy of the act with respect to all milk subject to the provisions of the order during the month of April 1948.

(b) In accordance with the Administrative Procedure Act (Public Law 404, 79th Cong., 60 Stat. 237), notice of proposed rule making, public procedure thereon, and 30 days prior notice of the effective date hereof are found to be impracticable, unnecessary, and contrary to the public interest in that it is necessary to issue immediately and make effective not later than April 1, 1948, this suspension order to reflect current marketing conditions, to facilitate, promote, and maintain the orderly marketing of milk produced for the Cincinnati, Ohio, milk marketing area, and to insure the production of an adequate supply of milk for future months. The continuation of the March 1948, price differentials for Class I and Class II milk during the months of April through July, 1948, was considered at a public hearing held March 11, 1948, notice of which was published in the FEDERAL REGISTER (13 F. R. 1267). The changes effected by this suspension do not require substantial or extensive preparation by persons affected prior to the effective date. The time intervening between the date of issuance of this suspension and its effective date affords persons affected a reasonable time to prepare for its effective date.

It is therefore ordered, That the provisions of the order "\$1.05 for the delivery periods of April through July and

*** for the delivery periods of August through March" appearing in § 965.6 (a) (1) and the provisions "\$0.60 for the delivery periods of April through July and *** for the delivery periods of August through March" appearing in § 965.6 (a) (2) be and they hereby are suspended with respect to all milk subject to the provisions of the order during the month of April 1948.

(48 Stat. 31, 670, 675, 49 Stat. 750; 50 Stat. 246; 7 U. S. C. 601 et seq.)

Done at Washington, D. C., this 26th day of March 1948.

[SEAL] N. E. DODD,
Acting Secretary of Agriculture.

[F. R. Doc. 48-2856; Filed, Mar. 30, 1948; 8:51 a. m.]

PART 971—MILK IN DAYTON-SPRINGFIELD, OHIO, MILK MARKETING AREA

ORDER SUSPENDING CERTAIN PROVISIONS

Pursuant to notice published in the FEDERAL REGISTER (13 F. R. 1568), and actual notice given to interested parties prior thereto, consideration has been given to the suspension, for the month of April 1948, of the word "April" from the tables appearing in § 971.5 (b) (1) and (c) (1) of Order No. 71, as amended, regulating the handling of milk in the Dayton-Springfield, Ohio, marketing area, hereinafter referred to as the "order," so that the amounts to be added to the basic formula price for the computation of Class I and Class II milk prices for the month of April 1948 will be the same as those required to be added to the basic formula price for the preceding month.

Pursuant to the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U. S. C., 601 et seq.), hereinafter referred to as the "act," and to the order, and after having considered all relevant information, including the written data, views, and arguments which were filed with the Hearing Clerk pursuant to the notice above referred to, it is hereby found and determined that:

(a) The word "April" appearing in the tables set forth in § 971.5 (b) (1) and (c) (1) of the aforesaid order does not tend to effectuate the declared policy of the act with respect to all milk subject to the provisions of the order during the month of April 1948.

(b) In accordance with the Administrative Procedure Act (Public Law 404, 79th Cong.; 60 Stat. 237), the giving of 30 days prior notice of the effective date hereof is found to be impracticable, unnecessary, and contrary to the public interest in that it is necessary to issue immediately and to make effective not later than April 1, 1948, this suspension order to reflect current marketing conditions, to facilitate, promote, and maintain the orderly marketing of milk produced for the Dayton-Springfield, Ohio, milk marketing area, and to insure the production of an adequate supply of milk for that market for future months. No-

tice of consideration of this suspension action was published in the *FEDERAL REGISTER* for March 24, 1948 (13 F. R. 1568). The changes effected by this suspension do not require substantial or extensive preparation by the persons affected prior to the effective date. The time intervening between the date of issuance of this suspension and its effective date affords the persons affected a reasonable time to prepare for its effective date.

It is therefore ordered, That, the word "April" appearing in the tables set forth in § 971.5 (b) (1) and (c) (1) of the aforesaid order be and hereby is suspended with respect to all milk subject to the provisions of the order during the month of April 1948.

(48 Stat. 31, 670, 675, 49 Stat. 750, 50 Stat. 246; 7 U. S. C. 601 et seq.)

Issued at Washington, D. C., this 29th day of March 1948.

[SEAL] CLINTON P. ANDERSON,
Secretary of Agriculture.

[F. R. Doc. 48-2904; Filed, Mar. 30, 1948; 9:55 a. m.]

PART 972—MILK IN TRI-STATE MILK MARKETING AREA

ORDER SUSPENDING CERTAIN PROVISIONS

Pursuant to the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U. S. C. 601 et seq.), hereinafter referred to as the "act," and of the order, as amended, regulating the handling of milk in the Tri-State milk marketing area, hereinafter referred to as the "order," it is hereby found and determined that:

(a) The following provisions of the order do not tend to effectuate the declared policy of the act with respect to all milk subject to the provisions of the order during the month of April 1948:

(1) All the amounts or figures contained in the table or schedule appearing in § 972.5 (b) except "\$1.35" and "\$1.15."

(2) All the amounts or figures contained in the table or schedule appearing in § 972.5 (c) except "\$1.05" and "\$0.85."

(b) In accordance with the Administrative Procedure Act (Public Law 404, 79th Cong., 60 Stat. 237), notice of proposed rule making, public procedure thereon, and 30 days prior notice of the effective date hereof are found to be impracticable, unnecessary, and contrary to the public interest in that it is necessary to issue immediately and make effective not later than April 1, 1948, this suspension order to reflect current marketing conditions, to facilitate, promote, and maintain the orderly marketing of milk produced for the Tri-State milk marketing area, and to insure the production of an adequate supply of milk for future months. The level of Class I and Class II price differentials during the months of April through July 1948 was considered at a public hearing held March 15, 1948, notice of which was published in the *FEDERAL REGISTER* (13 F. R. 1308). The changes effected by this suspension order do not require substantial or ex-

tensive preparation by persons affected prior to the effective date. The time intervening between the date of issuance of this suspension and its effective date affords persons affected a reasonable time to prepare for its effective date.

It is therefore ordered, That the following provisions of the order be and they hereby are suspended with respect to all milk subject to the provisions of the order during the month of April 1948:

1. All the amounts or figures contained in the table or schedule appearing in § 972.5 (b) except "\$1.35" and "1.15."

2. All the amounts or figures contained in the table or schedule appearing in § 972.5 (c) except "\$1.05" and "\$0.85."

(48 Stat. 31, 670, 675, 49 Stat. 750; 50 Stat. 246; 7 U. S. C. 601 et seq.)

Done at Washington, D. C., this 26th day of March 1948.

[SEAL] N. E. DODD,
Acting Secretary of Agriculture.

[F. R. Doc. 48-2857; Filed, Mar. 30, 1948; 8:51 a. m.]

PART 974—MILK IN COLUMBUS, OHIO, MILK MARKETING AREA

ORDER SUSPENDING CERTAIN PROVISIONS

Pursuant to the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U. S. C. 601 et seq.), hereinafter referred to as the "act," and of the order, as amended, regulating the handling of milk in the Columbus, Ohio, milk marketing area, hereinafter referred to as the "order," it is hereby found and determined that:

(a) The following provisions set forth in the schedule of Class I, Class II, and Class III skim milk and butterfat values to be added to basic prices, appearing in § 974.5 (b) of the order do not tend to effectuate the declared policy of the act with respect to all milk subject to the provisions of the order during the month of April 1948:

August through March	April through July	August through March	April through July
	\$0.2098		\$15.64
	.1399		10.43
	.0979		7.30

(b) In accordance with the Administrative Procedure Act (Public Law 404, 79th Cong., 60 Stat. 237), notice of proposed rule making, public procedure thereon, and 30 days prior notice of the effective date hereof are found to be impracticable, unnecessary, and contrary to the public interest in that it is necessary to issue immediately and make effective not later than April 1, 1948, this suspension order to reflect current marketing conditions, to facilitate, promote, and maintain the orderly marketing of milk produced for the Columbus, Ohio, milk marketing area, and to insure the production of an adequate supply of milk for future months. The establishment of differentials for Class I, Class II, and Class III milk at the March 1948 levels

for the months of April through July, was considered at a public hearing held March 8-10, 1948, notice of which was published in the *FEDERAL REGISTER* (13 F. R. 809). The changes effected by this suspension do not require substantial or extensive preparation by persons affected prior to the effective date. The time intervening between the date of issuance of this suspension and its effective date affords persons affected a reasonable time to prepare for its effective date.

It is therefore ordered, That the following provisions set forth in the schedule of Class I, Class II, and Class III skim milk and butterfat values to be added to basic prices, appearing in § 974.5 (b) of the order be and they hereby are suspended with respect to all milk subject to the provisions of the order during the month of April 1948:

August through March	April through July	August through March	April through July
	\$0.2098		\$15.64
	.1399		10.43
	.0979		7.30

(48 Stat. 31, 670, 675, 49 Stat. 750; 50 Stat. 246; 7 U. S. C. 601 et seq.)

Done at Washington, D. C., this 26th day of March 1948.

[SEAL] N. E. DODD,
Acting Secretary of Agriculture.

[F. R. Doc. 48-2854; Filed, Mar. 30, 1948; 8:50 a. m.]

PART 975—MILK IN CLEVELAND, OHIO, MILK MARKETING AREA

ORDER SUSPENDING CERTAIN PROVISIONS

Pursuant to the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U. S. C. 601 et seq.), hereinafter referred to as the "act," and of the order, as amended, regulating the handling of milk in the Cleveland, Ohio, milk marketing area, hereinafter referred to as the "order," it is hereby found and determined that:

(a) The provisions of the order set forth in § 975.6 (b) (1) except "Add to the basic formula price * * * \$1.15: * * * *Provided*, * * * That the minimum price of sweet or sour cream, or of any mixture of cream and milk (or skim milk), in Class I milk shall be the price otherwise applicable pursuant to this subparagraph less 15 cents" do not tend to effectuate the declared policy of the act with respect to all milk subject to the provisions of the order during the month of April 1948.

(b) In accordance with the Administrative Procedure Act (Public Law 404, 79th Cong., 60 Stat. 237), notice of proposed rule making, public procedure thereon, and 30 days prior notice of the effective date hereof are found to be impracticable, unnecessary, and contrary to the public interest in that it is necessary to issue immediately and make effective not later than April 1, 1948, this suspension order to reflect current marketing conditions, to facilitate, promote, and maintain the orderly marketing of milk pro-

duced for the Cleveland, Ohio, milk marketing area, and to insure the production of an adequate supply of milk for future months. The level of Class I price differentials was considered at a public hearing held March 18-19, 1948, notice of which was published in the *FEDERAL REGISTER* (13 F. R. 1326). The changes effected by this suspension order do not require substantial or extensive preparation by persons affected prior to the effective date. The time intervening between the date of issuance of this suspension and its effective date affords persons affected a reasonable time to prepare for its effective date.

It is therefore ordered, That the provisions of the order appearing in §975.6 (b) (1), except "Add to the basic formula price * * * \$1.15: * * * Provided, * * * That the minimum price of sweet or sour cream, or of any mixture of cream and milk (or skim milk), in Class I milk shall be the price otherwise applicable pursuant to this subparagraph less 15 cents" be and hereby are suspended with respect to all milk subject to the provisions of the order during the month of April 1948.

(48 Stat. 31, 670, 675, 49 Stat. 750; 50 Stat. 246; 7 U. S. C. 601 et seq.)

Done at Washington, D. C., this 26th day of March 1948.

[SEAL] N. E. DODD,
Acting Secretary of Agriculture.

[F. R. Doc. 48-2855; Filed Mar. 30, 1948;
8:50 a. m.]

TITLE 16—COMMERCIAL PRACTICES

Chapter I—Federal Trade Commission

[Docket No. 4857]

PART 3—DIGEST OF CEASE AND DESIST ORDERS

PLAZA LUGGAGE & SUPPLY CO., INC., ET AL.

§ 3.6 (a) *Advertising falsely or misleadingly—Business status, advantages or connections of advertiser—Producer status of dealer or seller—Manufacturer:* § 3.6 (r) *Advertising falsely or misleadingly—Prices—Discount savings:* § 3.6 (r) *Advertising falsely or misleadingly—Prices—List or catalog as regular selling:* § 3.6 (r) *Advertising falsely or misleadingly—Prices—Retail or selling as wholesale, jobbing, factory distributor's, etc., or discounted.* In connection with the offering for sale, sale, and distribution of luggage, billfolds, and other items of merchandise in commerce, (1) representing, directly or by implication, that respondents manufacture the merchandise sold or distributed by them through the use of the term "manufacturer" or "Mfrs." or any other term or abbreviation of similar import or meaning on billheads, stationery, in advertising, or in any other manner; (2) using pictorial representations of manufacturing processes in such a manner as to represent or imply that respondents manufacture the merchandise described by such pictorial representations; (3) using

the term "list price," "catalog price," or any other term of similar import or meaning to designate, describe, or refer to prices which are not in fact the bona fide regular established selling prices of the merchandise offered for sale as established by the usual and customary sales in the normal course of business; (4) representing as a catalog, list, or retail price any fictitious price which is in excess of the price at which the article of merchandise is sold or is expected to be sold at retail; (5) representing that respondents are selling their merchandise at wholesale prices by allowing discounts from list, catalog, or retail prices when such prices, after application of such discounts, are in excess of the usual or customary prices at which manufacturers, wholesalers, or distributors offer for sale or sell the same or comparable articles of merchandise in the normal course of business; or (6) representing that any specified saving or discount from the retail price is offered purchaser upon purchase of any article of merchandise when such saving or discount is based upon a fictitious retail price; prohibited. (Sec. 5, 38 Stat. 719, as amended by sec. 3, 52 Stat. 112; 15 U. S. C., sec. 45b) [Cease and desist order, Plaza Luggage & Supply Company, Inc. et al., Docket 4857, January 30, 1948]

At a regular session of the Federal Trade Commission, held at its office in the city of Washington, D. C., on the 30th day of January A. D. 1948.

In the Matter of Plaza Luggage & Supply Company, Inc., a Corporation, and Benjamin Goldstein and Abraham Goldstein, Copartners, Trading and Doing Business as U. S. Luggage & Leather Products Company

This proceeding having been heard by the Federal Trade Commission upon the complaint of the Commission, the answer of the respondents, and a stipulation as to the facts, in which stipulation the respondents waived all intervening procedure and further hearing as to the said facts, and the Commission having made its findings as to the facts and conclusion that the respondents Benjamin Goldstein and Abraham Goldstein, copartners, trading and doing business as U. S. Luggage & Leather Products Company, have violated the provisions of the Federal Trade Commission Act:

It is ordered, That the respondents Benjamin Goldstein and Abraham Goldstein, individually and trading as U. S. Luggage & Leather Products Company or trading under any other trade name, and their respective representatives, agents, and employees, directly or through any corporate or other device in connection with the offering for sale, sale, and distribution of luggage, billfolds, and other items of merchandise in commerce as "commerce" is defined in the Federal Trade Commission Act, do forthwith cease and desist from:

1. Representing, directly or by implication, that respondents manufacture the merchandise sold or distributed by them through the use of the term "manufacturer" or "Mfrs." or any other term or abbreviation of similar import or meaning on billheads, stationery, in advertising, or in any other manner.

2. Using pictorial representations of manufacturing processes in such a manner as to represent or imply that respondents manufacture the merchandise described by such pictorial representations.

3. Using the term "list price," "catalog price," or any other term of similar import or meaning to designate, describe, or refer to prices which are not in fact the bona fide regular established selling prices of the merchandise offered for sale as established by the usual and customary sales in the normal course of business.

4. Representing as a catalog, list, or retail price any fictitious price which is in excess of the price at which the article of merchandise is sold or is expected to be sold at retail.

5. Representing that respondents are selling their merchandise at wholesale prices by allowing discounts from list, catalog, or retail prices when such prices, after application of such discounts, are in excess of the usual or customary prices at which manufacturers, wholesalers, or distributors offer for sale or sell the same or comparable articles of merchandise in the normal course of business.

6. Representing that any specified saving or discount from the retail price is offered purchaser upon purchase of any article of merchandise when such saving or discount is based upon a fictitious retail price.

It is further ordered, That the complaint be, and the same hereby is, dismissed as to the respondent Plaza Luggage & Supply Company, Inc., a corporation.

It is further ordered, That the respondents shall, within sixty (60) days after service upon them of this order, file with the Commission a report in writing, setting forth in detail the manner and form in which they have complied with this order.

By the Commission.

[SEAL] OTIS B. JOHNSON,
Secretary.

[F. R. Doc. 48-2786; Filed, Mar. 30, 1948;
8:52 a. m.]

TITLE 19—CUSTOMS DUTIES

Chapter I—Bureau of Customs, Department of the Treasury

[T. D. 51869]

PART 8—LIABILITY FOR DUTIES, ENTRY OF IMPORTED MERCHANDISE

SUBSTITUTION OF WAREHOUSE ENTRY FOR CONSUMPTION ENTRY

Section 8.30, Customs Regulations of 1943 (19 CFR, Cum. Supp., 8.30), is amended by deleting the word "not" from the heading; redesignating paragraph (e) as (f); and inserting a new paragraph (e) as follows:

§ 8.30 *Form and contents; articles not entitled to entry.* * * *

(e) A warehouse entry may be substituted for a consumption entry covering merchandise which has remained in continuous customs custody. In such a case, the superseded consumption entry

shall be liquidated for refund of any estimated duties deposited without awaiting liquidation of the warehouse entry.

(Sec. 557, 46 Stat. 744, secs. 2, 22, 23, 52 Stat. 1077, 1087, 1088, sec. 624, 46 Stat. 759; 19 U. S. C. 1557, 1624)

[SEAL] FRANK DOW,
Acting Commissioner of Customs.

Approved: March 24, 1948.

E. H. FOLEY, Jr.,
Acting Secretary of the Treasury.

[F. R. Doc. 48-2816; Filed, Mar. 30, 1948;
8:49 a. m.]

[T. D. 51868]

PART 10—ARTICLES CONDITIONALLY FREE,
SUBJECT TO A REDUCED RATE, ETC.

PART 25—CUSTOMS BONDS
TEMPORARY IMPORTATIONS

1. Section 10.31 (c), Customs Regulations of 1943 (19 CFR, Cum. Supp., 10.31 (c)), is hereby amended to read as follows:

§ 10.31 Entry; bond. * * *

(c) A bond shall be given in an amount equal to one and one-quarter times the duties which it is estimated would accrue had all the articles covered by the entry been entered under an ordinary consumption entry. When the articles are entered under paragraph 1607 or section 308 of the tariff act, as amended, the bond shall be on customs Form 7563 or other appropriate form; when under paragraph 1747 or 1808 of the tariff act, on customs form 7565. Cash deposits in the amount of the bond may be accepted in lieu of sureties. Such deposits shall be placed in the collector's special deposit account and customs form 5117-B shall be used as a collection voucher and receipt.

(Pars. 1607, 1747, 1808, 1809; sec. 201, 46 Stat. 673, 680, 684, sec. 308, 46 Stat. 690, sec. 4, 52 Stat. 1079; sec. 624, 46 Stat. 759; 19 U. S. C. 1201, 1308, 1624)

2. Section 10.31 (e), Customs Regulations of 1943 (19 CFR, Cum. Supp., 10.31 (e)), is hereby amended by changing the last sentence to read as follows: "If the articles were entered under paragraph 1607 or section 308 of the tariff act, as amended, the entry shall be liquidated free of duty, but at the time of such liquidation the amount of duties which would have accrued if the bond had not been given shall be ascertained for use in connection with the consideration of any petition for relief from the payment of liquidated damages."

(Pars. 1607, 1747, 1808, 1809; sec. 201, 46 Stat. 673, 680, 684, sec. 308, 46 Stat. 690, sec. 4, 52 Stat. 1079, sec. 624, 46 Stat. 759; 19 U. S. C. 1201, 1308, 1624)

3. Section 10.37, Customs Regulations of 1943 (19 CFR, Cum. Supp., 10.37), is hereby amended to read as follows:

§ 10.37 Extension of bonds. Bonds given under paragraph 1607, Tariff Act of 1930, cannot be extended. All other 6-months' bonds to secure the exporta-

tion of temporary importations may be extended for a further period of 6 months by the collector of customs at the port where the entry was filed upon written application to such collector on customs Form 3173, provided the articles have not been exported (or duly destroyed) prior to the date of the receipt by the collector of the application, or liquidated damages have not been assessed under the bond prior to such receipt. (Pars. 1607, 1747, 1808; sec. 201, 46 Stat. 673, 680, 684, sec. 308, 46 Stat. 690, sec. 4, 52 Stat. 1079, sec. 624, 46 Stat. 759; 19 U. S. C. 1201, 1308, 1624)

4. Section 10.38 (c), Customs Regulations of 1943 (19 CFR, Cum. Supp., 10.38 (c)), is hereby amended to read as follows:

§ 10.38 Exportation. * * *

(c) If exportation is to be made at a port other than the one at which the merchandise was entered, the application on customs Form 3495 shall be filed in duplicate. There shall also be filed with the application a certified copy of the import entry or a certified copy of the invoice used on entry.

(Sec. 624, 46 Stat. 759; 19 U. S. C. 1624)

5. Section 10.39 (d), Customs Regulations of 1943 (19 CFR, Cum. Supp., 10.39 (d)), is hereby amended to read as follows:

§ 10.39 Cancellation of bonds. * * *

(d) If any article has not been exported or destroyed in accordance with the regulations in this part within the bond period (including any lawful extension), the collector shall (1) collect the duties found due on such article, if entered under paragraph 1747 or 1808; or (2) if the article was entered under paragraph 1607 or section 308 of the tariff act, as amended, make a demand in writing under the bond for the payment of liquidated damages equal to the entire amount of the bond, except that if the entry covering the articles is charged against a term bond the demand shall be limited to an amount equal to one and one-quarter times the estimated duties applicable to such entry. The written demand shall include a statement that a written application for relief from the payment of the full liquidated damages may be filed with the collector within 60 days after the date of the demand. If a written application for relief is timely filed, such application, together with a full report of the facts, shall be transmitted to the Bureau for decision, except that if the full amount of liquidated damages does not exceed \$1,000, collectors of customs may cancel the liability incurred under the bond upon the payment of one and one-quarter times the duties which would have accrued on the merchandise not disposed of in accordance with the terms of the bond had such merchandise been entered under an ordinary consumption entry, provided the collector is satisfied that the law and regulations have been complied with and there was no intent to defraud the revenue. (Pars. 1607, 1747, 1808; sec. 201, 46 Stat. 673, 680, 684, sec. 308, 46 Stat. 690, sec. 4, 52 Stat. 1079, sec. 624, 46 Stat. 759; 19 U. S. C. 1201, 1308, 1624).

6. Paragraph (b) of § 10.40 Refund of special deposits, Customs Regulations of 1943 (19 CFR, Cum. Supp., 10.40 (b)), is hereby amended by inserting the words "or, in appropriate cases, the collector of customs," in the last sentence after the word "Customs."

(Sec. 624, 46 Stat. 759; 19 U. S. C. 1624)

7. Paragraph (c) of § 10.41 Horses, vehicles, and craft brought in for a temporary stay, Customs Regulations of 1943 (19 CFR, Cum. Supp., 10.41 (c)), is hereby amended by deleting the second and third sentences thereof.

(R. S. 251, sec. 624, 46 Stat. 759; 19 U. S. C. 66, 1624)

8. Section 10.41 (h), Customs Regulations of 1943 (19 CFR, Cum. Supp., 10.41 (h)), is hereby amended by changing the last sentence to read as follows: "Each horse, vehicle, or craft shall be subject to forfeiture if it (1) has entered the United States under a touring certificate under the provisions of this section and is not duly exported, destroyed, or entered under bond, within the period of such certificate, or (2) is determined to have been imported (except as provided for in paragraph (f)) for the transportation of persons or articles for hire, or (3) is determined to have been imported primarily for the carriage of articles."

(R. S. 251, sec. 624, 46 Stat. 759; 19 U. S. C. 66, 1624)

9. Paragraph (a) of § 25.15 Export bonds; cancellation, Customs Regulations of 1943 (19 CFR, Cum. Supp., 25.15 (a)), is hereby amended by eliminating the word "penal" in the first sentence; by eliminating the period after the word "Customs"; and by inserting immediately after the word "Customs" the words "or by the collector of customs in accordance with the provisions of § 10.39 (d)."

(Sec. 30, 52 Stat. 1089, sec. 624, 46 Stat. 759; 19 U. S. C. 1623, 1624)

[SEAL] FRANK DOW,
Acting Commissioner of Customs.

Approved: February 18, 1948.

A. L. M. Wiggins,
Acting Secretary of the Treasury.

[F. R. Doc. 48-2815; Filed, Mar. 30, 1948;
8:49 a. m.]

TITLE 50—WILDLIFE

Chapter III—International Fisheries Commission

PART 301—PACIFIC HALIBUT FISHERIES

Regulations of the International Fisheries Commission adopted pursuant to the Pacific halibut fishery convention between the United States of America and the Dominion of Canada, signed January 29, 1937.

- Sec.
- 301.1 Regulatory areas.
 - 301.2 Limit of catch in each area.
 - 301.3 Length of closed season.
 - 301.4 Issuance of licenses and conditions limiting their validity.
 - 301.5 Retention of halibut taken with other fish under permit.

Sec.	
301.6	Issuance of permits and conditions limiting their validity.
301.7	Statistical return by vessels.
301.8	Statistical return by dealers.
301.9	Closed small halibut grounds.
301.10	Dory gear prohibited.
301.11	Nets prohibited.
301.12	Retention of tagged halibut.
301.13	Responsibility of master.
301.14	Supervision of unloading and weighing.

AUTHORITY: §§ 301.1 to 301.14, inclusive, issued under 50 Stat. 1351.

§ 301.1 *Regulatory areas.* (a) Convention waters which include the territorial waters and the high seas off the western coasts of Canada and the United States of America including the southern as well as the western coasts of Alaska, shall be divided into the following areas, all directions given being magnetic unless otherwise stated.

(b) Area 1A shall include all convention waters southeast of a line running northeast and southwest through Cape Blanco Light, as shown on Chart 5952, published in February 1935, by the United States Coast and Geodetic Survey, which light is approximately latitude 42°50'14" N., longitude 124°33'45" W.

(c) Area 1B shall include all convention waters between Area 1A and a line running northeast and southwest through Willapa Bay Light on Cape Shoalwater, as shown on Chart 6185, published in July 1939, by the United States Coast and Geodetic Survey, which light is approximately latitude 46°43'17" N., longitude 124°04'15" W.

(d) Area 2 shall include all convention waters off the coasts of the United States of America and of Alaska and of the Dominion of Canada between Area 1B and a line running through the most westerly point of Glacier Bay, Alaska, to Cape Spencer Light as shown on Chart 8304, published in June 1940, by the United States Coast and Geodetic Survey, which light is approximately latitude 58°11'57" N., longitude 136°38'18" W., thence south one-quarter east and is exclusive of the areas closed to all halibut fishing in § 301.9.

(e) Area 3 shall include all the convention waters off the coast of Alaska that are between Area 2 and a straight line running from the light on Cape Kabuch at the head of Ikatan Bay as shown on Chart 8701 published in February 1943, by the United States Coast and Geodetic Survey which light is approximately latitude 53°49'03" N., longitude 163°21'42" W., thence to Cape Sarichef Light at the western end of Unimak Island as shown on Chart 8860 published in December 1942 (12th Edition) by the United States Coast and Geodetic Survey which light is approximately latitude 54°36'00" N., longitude 164°55'45" W., thence true west.

(f) Area 4 shall include all convention waters in Bering Sea which are not included in Area 3.

§ 301.2 *Limit of catch in each area.* (a) The catch of halibut to be taken during the halibut fishing season of the year 1948 from Area 2 shall be limited

to approximately 25,500,000 pounds of salable halibut, and from Area 3 to approximately 28,000,000 pounds of salable halibut, and from Area 4 to approximately 500,000 pounds of salable halibut, the weights in each or any such limit to be computed as with heads off and entrails removed.

(b) The catch of halibut to be taken from each area during the halibut fishing season of the year 1948 shall also be limited to halibut which with the head on are 26 inches or more in length as measured from the tip of the lower jaw to the extreme end of the middle of the tail or to halibut which with the head off and entrails removed are 5 pounds or more in weight, and the possession of any halibut of less than the above length or the above weight, according to whether the head is on or off, by any vessel or by any master or operator of any vessel or by any person, firm, or corporation, is prohibited.

(c) The International Fisheries Commission shall as early in the said year as is practicable determine the date on which it deems each limit of catch defined in paragraph (a) of this section will be attained, and the limit of each such catch shall then be that which shall be taken prior to said date, and fishing for or catching of halibut in the area or areas to which such limit applies shall at that date be prohibited until after the end of the closed season as defined and modified in § 301.3, except as provided in § 301.5 and in Article I of the Convention, and provided that if it shall at any time become evident to the International Fisheries Commission that the limit will not be reached by such date, it may substitute another date.

§ 301.3 *Length of closed season.* (a) Under the authority of Article I of the aforesaid Convention the closed season as therein defined shall be modified so as to end at 12 midnight of the 30th day of April of the year 1948 and of each year thereafter and shall begin at 12 midnight of the 30th day of November of each year unless an earlier date is determined upon for any area under the provisions of paragraph (b) of this section.

(b) Under authority of Article I of the Convention, the closed season as therein defined shall begin in each area on the date on which the limit is reached as provided in paragraph (c) of § 301.2 and the closing of such area or areas shall be taken to have been duly approved unless before the said date either the President of the United States of America or the Governor General of Canada shall have signified his disapproval, (the burden of proving any such signification being upon the person alleging it) And provided, That the closing date of Area 2 or of Area 3, whichever shall be later, shall apply to Areas 1A and 4, unless Area 4 shall have been previously closed under this section, and that the closing date of Area 2 shall apply to Area 1B.

(c) Nothing contained in the regulations in this part shall prohibit the fishing for species of fish other than halibut or prohibit the International Fisheries Commission from conducting fishing op-

erations as provided for in Article I of the Convention.

§ 301.4 *Issuance of licenses and conditions limiting their validity.* (a) All vessels of any tonnage which shall fish for halibut in any manner or hold halibut in possession in any area, or which shall transport halibut otherwise than as a common carrier documented by the Government of the United States or of Canada for the carriage of freight, must be licensed by the International Fisheries Commission, *Provided*, That vessels of less than five net tons or vessels which do not use set lines need not be licensed unless they shall require a permit as provided in § 301.5.

(b) Each vessel licensed by the International Fisheries Commission shall carry on board at all times while at sea the halibut license thus secured whether it is validated for halibut fishing or endorsed with a permit as provided in § 301.6 and this license shall at all times be subject to inspection by authorized officers of either of said Governments or by representatives of the International Fisheries Commission.

(c) The halibut license shall be issued without fee by the customs officers of either of said Governments or by representatives of the International Fisheries Commission or by fishery officers of either of said Governments at places where there are neither customs officers nor representatives of the International Fisheries Commission. A new license may be issued by the officer accepting statistical return at any time to vessels which have furnished proof of loss of the license form previously issued, or when there shall be no further space for record thereon, providing the receipt of statistical return shall be shown on the new form for any halibut or other species taken during or after the voyage upon which loss occurred. The old license form shall be forwarded in each case to the International Fisheries Commission.

(d) The halibut license of any vessel shall be validated before departure from port for each halibut fishing operation for which statistical returns are required. This validation of a license shall be by customs officers or by fishery officers of either of said Governments when available at places where there are no customs officers and shall not be made unless the area in which the vessel will fish is entered on the license form and unless the provisions of § 301.7 have been complied with for all landings and all fishing operations since issue of the license, *Provided*, That if the master or operator of any vessel shall fail to comply with the provisions of § 301.7, the halibut license of such vessel may be validated by customs officers upon evidence either that there has been a judicial determination of the offense or that the laws prescribing penalties therefor have been complied with, or that the said master or operator is no longer responsible for, nor sharing in, the operations of said vessel.

(e) The halibut license of any vessel fishing for halibut in Area 1A as defined in § 301.1 after the closure of Areas 1B and 2 must be validated at a port or place

within Area 1A prior to each such fishing operation.

(f) No halibut license shall be validated for departure for halibut fishing in Areas 1A or 1B or 2 more than three days, and in Areas 3 or 4 more than five days before the end of the closed season as defined in § 301.3 (a).

(g) No halibut license shall be valid for halibut fishing in more than one area, as defined in § 301.1, during any one trip nor shall it be revalidated for halibut fishing in another such area while the vessel has any halibut on board.

(h) The halibut license shall not be valid for halibut fishing in any area closed to halibut fishing or for the possession of halibut in any area closed to halibut fishing except while in actual transit to or within a port of sale.

(i) The halibut license shall not be valid for halibut fishing in any area while a permit endorsed thereon is in effect, nor shall it be validated while halibut taken under such permit is on board.

(j) The halibut license of any vessel shall not be valid for the possession of any halibut in any area other than that for which validated, if such vessel is in possession of baited gear, except in those waters included within a twenty-five mile radius of Cape Spencer Light, Alaska.

§ 301.5 *Retention of halibut taken with other fish under permit.* (a) There may be retained for sale on any vessel which shall have a permit as provided in § 301.6 such halibut as is caught incidentally to fishing by that vessel in any area that is closed to halibut fishing under § 301.2 with set lines (of the type commonly used in the Pacific coast halibut fishery) for other species, not to exceed at any time one pound of halibut for each seven pounds of salable fish, actually utilized, of other species not including salmon or tuna, and such halibut may be sold as the catch of said vessel, the weight of all fish to be computed as with heads off and entrails removed; *Provided*, That it shall not be a violation of this section for any such vessel to have in possession halibut in addition to the amount herein allowed to be sold if such additional halibut shall not exceed thirty per cent of such amount and shall be forfeited and surrendered at the time of landing as provided in paragraph (d) of this section.

(b) The catch of halibut taken and retained under such permit shall be limited to halibut which with the head on are 26 inches or more in length as measured from the tip of the lower jaw to the extreme end of the middle of the tail or to halibut which with the head off and entrails removed are 5 pounds or more in weight, and the possession of any halibut of less than the above length or the above weight, according to whether the head is on or off, by any vessel or by any master or operator of any vessel or by any person, firm or corporation, is prohibited.

(c) Halibut retained under such permit shall not be landed or otherwise removed or be received by any person, firm or corporation from the catching vessel

until all halibut on board shall have been reported to a customs, fishery or other authorized enforcement officer of either of said Governments by the captain or operator of said vessel and also by the person, firm or corporation receiving the halibut, and no halibut or other fish shall be landed or removed or be received from the catching vessel except with the permission of said officer and under such supervision as the said officer may deem advisable.

(d) Halibut retained under such permit shall not be purchased or held in possession by any person other than the master, operator or crew of the catching vessel in excess of the proportion allowed in paragraph (a) of this section until such excess whatever its origin shall have been forfeited and surrendered to the customs, fishery or other authorized officers of either of said Governments. In forfeiting such excess, the vessel shall be permitted to surrender any part of its catch of halibut, *Provided*, That the amount retained shall not exceed the proportion herein allowed.

(e) Permits for the retention and landing of halibut in the year 1948 shall become invalid at 12 midnight of the 15th day of November of said year or at such earlier date as the International Fisheries Commission shall determine.

§ 301.6 *Issuance of permits and conditions limiting their validity.* (a) Any vessel which shall be used in fishing for other species than halibut in any area closed to halibut fishing under § 301.2 must have a halibut license and a permit if it shall retain, land, or sell any halibut caught incidentally to such fishing or possess any halibut of any origin during such fishing, as provided in § 301.5.

(b) The permit shall be shown by endorsement of the issuing officer on the face of the halibut license form held by said vessel and shall show the area for which the permit is issued.

(c) The permit shall terminate at the time of first landing thereafter of fish of any species and a new permit shall be secured before any subsequent fishing operation for which a permit is required.

(d) A permit shall not be issued to any vessel which shall have halibut on board taken while said vessel was licensed to fish in an open area unless such halibut shall be considered as taken under the issued permit and is thereby subject to forfeiture when landed if in excess of the proportion permitted in paragraph (a) of § 301.5.

(e) A permit shall not be issued to, or be valid if held by, any vessel which shall fish with other than set lines of the type commonly used in the Pacific coast halibut fishery.

(f) The permit of any vessel shall not be valid unless the permit is granted before departure from port for each fishing operation for which statistical returns are required. This granting of a permit shall be by customs officers or by fishery officers of either of said Governments when available at places where there are no customs officers and shall

not be made unless the area in which the vessel will fish is entered on the halibut license form and unless the provisions of § 301.7 have been complied with for all landings and all fishing operations since issue of the license or permit, provided that if the master or operator of any vessel shall fail to comply with the provisions of § 301.7, the permit of such vessel may be granted by customs officers upon evidence either that there has been a judicial determination of the offense or that the laws prescribing penalties therefor have been complied with, or that the said master or operator is no longer responsible for, nor sharing in, the operations of said vessel.

(g) The permit of any vessel shall not be valid if said vessel shall have in its possession at any time halibut in excess of the amount allowed under paragraph (a) of § 301.5.

§ 301.7 *Statistical return by vessels.*

(a) Statistical return as to the amount of halibut taken during fishing operations must be made by the master or operator of any vessel licensed under the regulations in this part, and as to the amount of halibut and other species by the master or operator of any vessel operating under permit as provided for in §§ 301.5 and 301.6 within 48 hours of landing, sale or transfer of halibut or of first entry thereafter into a port where there is an officer authorized to receive such return.

(b) The statistical return must state the port of landing and the amount of each species taken within the area defined in the regulations in this part, for which the vessel's license is validated.

(c) The statistical return must include all halibut landed or transferred to other vessels and all halibut held in possession on board and must be full, true and correct in all respects herein required. A copy of such return must be forwarded to the International Fisheries Commission at such times as the latter shall require.

(d) The master or operator and/or any person engaged on shares in the operation of any vessel licensed or holding a permit under the regulations in this part may be required by the International Fisheries Commission or by any officer of either of said Governments authorized to receive such return to certify to its correctness to the best of his information and belief and to support the certificate by a sworn statement. Validation of a halibut license or issuance of a permit after such sworn return is made shall be provisional and shall not render the license or permit valid in case the return shall later be shown to be false or fraudulently made.

(e) The master or operator of any vessel holding a license or permit under the regulations in this part shall keep an accurate log of all fishing operations including therein date, locality, amount of gear used, and the amount of halibut taken daily in each such locality. This log record shall be open to inspection of representatives of the International Fisheries Commission authorized for this purpose.

(f) The master, operator and/or any other person engaged on shares in the operation of any vessel licensed under these regulations may be required by the International Fisheries Commission or by any officer of either of said Governments to certify to the correctness of such log record to the best of his information and belief and to support the certificate by a sworn statement.

§ 301.8 Statistical return by dealers.

(a) All persons, firms or corporations that shall buy halibut or receive halibut for any purpose from fishing or transporting vessels or other carrier shall keep and on request furnish to customs officers or to any enforcing officer of either of said Governments or to representatives of the International Fisheries Commission, records of each purchase or receipt of halibut, showing date, locality, name of vessel, person, firm or corporation purchased or received from and the amount in pounds according to trade categories of the halibut and other species landed with the halibut.

(b) All persons, firms or corporations receiving fish from a vessel fishing under permit as provided in § 301.5 shall within 48 hours make to an authorized enforcing officer of either of said Governments a signed statistical return showing the date, locality, name of vessel received from and the amount of halibut and of other species landed with the halibut and certifying that permission to receive such fish was secured in accordance with paragraph (c) of § 301.5. Such persons, firms or corporations may be required by any officer of either of said Governments to support the accuracy of the above signed statistical return with a sworn statement.

(c) All records of all persons, firms or corporations concerning the landing, purchase, receipt and sale of halibut and other species landed therewith shall be open at all times to inspection of any enforcement officer of either of said Governments or of any authorized representative of the International Fisheries Commission. Such persons, firms or corporations may be required to certify to the correctness of such records and to support the certificate by a sworn statement.

(d) The possession by any person, firm, or corporation of halibut which such person, firm or corporation knows to have been taken by a vessel without a valid halibut license or a vessel without a permit when such license or permit is required, is prohibited.

§ 301.9 Closed small halibut grounds.

(a) The following areas have been found to be populated by small, immature halibut and are hereby closed to all halibut fishing and the possession of halibut of any origin is prohibited therein during fishing for other species:

(b) First, that area in the waters off the coast of Alaska within the following boundary as stated in terms of the magnetic compass unless otherwise indicated: from the north extremity of Cape Ulitka, Noyes Island, approximately latitude 55°33'48" N., longitude 133°43'35" W., to

the south extremity of Wood Island, approximately latitude 55°39'44" N., longitude 133°42'29" W.; thence to the east extremity of Timbered Islet, approximately latitude 55°41'47" N., longitude 133°47'42" W.; thence to the true west extremity of Timbered Islet, approximately latitude 55°41'46" N., longitude 133°48'01" W.; thence southwest three-quarters south sixteen and five-eighths miles to a point approximately latitude 55°34'46" N., longitude 134°14'40" W.; thence southeast by south twelve and one-half miles to a point approximately latitude 55°22'23" N., longitude 134°12'48" W.; thence northeast thirteen and seven-eighths miles to the southern extremity of Cape Addington, Noyes Island, latitude 55°26'11" N., longitude 133°49'12" W.; and to the point of origin on Cape Ulitka. The boundary lines herein indicated shall be determined from Chart 8157, as published by the United States Coast and Geodetic Survey at Washington, D. C., in June, 1929, and Chart 8152, as published by the United States Coast and Geodetic Survey at Washington, D. C., in March, 1933, and reissued March, 1939, except for the point of Cape Addington which shall be determined from Chart 8158, as published by the United States Coast and Geodetic Survey in December, 1923. *Provided*, That the duly authorized officers of the United States of America may at any time place a plainly visible mark or marks at any point or points as nearly as practicable on the boundary line defined herein, and such mark or marks shall thereafter be considered as correctly defining said boundary.

(c) Second, that area lying in the waters off the northern coast of Graham Island, British Columbia, within the following boundary, and including the waters of Sturgess Bay, Masset Sound, Masset Inlet, and bays and inlets thereof: from the northwest extremity of Wiah Point, latitude 54°06'50" N., longitude 132°19'18" W., true north five and one-half miles to a point approximately latitude 54°12'20" N., longitude 132°19'18" W.; thence true east approximately sixteen and three-tenths miles to a point which shall lie northwest (according to magnetic compass at any time) of the highest point of Tow Hill, Graham Island, latitude 54°04'24" N., longitude 131°48'00" W.; thence southeast to the said highest point of Tow Hill. The points on the shoreline of the above mentioned island shall be determined from Chart 3754, published at the Admiralty, London, April 11, 1911, provided that the duly authorized officers of the Dominion of Canada may at any time place a plainly visible mark or marks at any point or points as nearly as practicable on the boundary line defined herein, and such marks shall thereafter be considered as correctly defining said boundary.

§ 301.10 Dory gear prohibited. The use of any hand gurdy or other appliance in hauling halibut gear by hand power in any dory or small boat operated from a vessel licensed under the provisions of these regulations is prohibited in all convention waters.

§ 301.11 Nets prohibited. It is prohibited to retain halibut taken with a net of any kind or to have in possession any halibut while using any net or nets other than bait nets for the capture of other species of fish, nor shall any license or permit held by any vessel under the regulations in this part be valid during the use or possession on board of any net or nets other than bait nets which are utilized for no other purpose than the capture of bait for said vessel.

§ 301.12 Retention of tagged halibut. Nothing contained in the regulations in this part shall prohibit any vessel at any time from retaining and landing any halibut which bears an International Fisheries Commission tag at the time of capture: *Provided*, That such halibut with the tag still attached is reported at the time of landing to representatives of the International Fisheries Commission or to enforcement officers of either of said Governments and is made available to them for examination.

§ 301.13 Responsibility of master. Wherever in the regulations in this part any duty is laid upon any vessel, it shall be the personal responsibility of the master or operator of said vessel to see that said duty is performed and he shall personally be responsible for the performance of said duty. This provision shall not be construed to relieve any member of the crew of any responsibility with which he would otherwise be chargeable.

§ 301.14 Supervision of unloading and weighing. The unloading and weighing of the halibut of any vessel licensed or holding a permit under the regulations in this part shall be under such supervision as the customs or other authorized officer may deem advisable in order to assure the fulfillment of the provisions of the regulations in this part.

Previous regulations superseded. These regulations shall supersede all previous regulations adopted pursuant to the Convention between the United States of America and the Dominion of Canada for preservation of the halibut fishery of the northern Pacific Ocean and Bering Sea, signed January 29, 1937, except as to offenses occurring prior to the approval of these regulations. These regulations shall be effective as to each succeeding year, with the dates herein specified changed accordingly, until superseded by subsequently approved regulations. Any determination made by the International Fisheries Commission pursuant to these regulations shall become effective immediately.

A. J. WHITMORE,
Chairman.
EDWARD W. ALLEN,
G. W. NICKERSON,
MILTON C. JAMES,
Secretary.

Approved: February 27, 1948.

HARRY S. TRUMAN,
The White House.

[F. R. Doc. 48-2853; Filed, Mar. 30, 1948; 9:01 a. m.]

TITLE 46—SHIPPING

Chapter I—Coast Guard: Inspection and Navigation

[CGFR 48-5]

MARINE ENGINEERING AND MATERIAL SPECIFICATIONS FOR MERCHANT VESSELS

Notices regarding proposed changes in the marine engineering regulations and material specifications were published in the *FEDERAL REGISTER* dated February 18 and August 22, 1947 (12 F. R. 1109, 5670), and public hearings were held by the Merchant Marine Council on March 26 and September 23, 1947, at Coast Guard Headquarters, Washington, D. C. All the comments and suggestions made at or submitted for these public hearings were considered and incorporated into the revised regulations where possible.

The regulations for marine engineering and material specifications for merchant vessels in 46 CFR, Parts 50 to 57, inclusive (Subchapter F—Marine Engineering), have been revised and brought up to date so that the regulations and specifications will reflect the experiences gained through wartime operations. In general, the changes are intended to clarify existing regulations; effect editorial changes; bring regulations into closer agreement with the requirements of the American Bureau of Shipping, the boiler and unfired pressure vessel codes of the American Society of Mechanical Engineers, and the standards of the American Society for Testing Materials; and incorporate numerous recommendations proposed by boiler manufacturers, marine engineers, and others. The Administrative Procedure Act (Pub. Law 404, 79th Cong., 60 Stat. 238, 5 U. S. C. 1001, et seq.) also intended that procedural rules should be separated from substantive regulations. Because of this and since it has become necessary to revise the marine engineering regulations and material specifications for merchant vessels to meet peacetime operating requirements, all the existing rules and regulations in 46 CFR, Parts 50 to 57, inclusive (Subchapter F—Marine Engineering), have been studied and where necessary they have been altered, reworded, or changed editorially so that they could be republished herein. The changes made in the substantive regulations previously published, as well as the new regulations which have been added, are in accordance with the recommendations of the Merchant Marine Council made after considering the comments and suggestions offered at the public hearings held March 26 and September 23, 1947. As the section numbers have been changed to conform with the style used when revising complete parts of regulations, two tables at the beginning of Subchapter F—Marine Engineering have been prepared showing the old section numbers with the new section numbers and also the new section numbers with the old section numbers.

By virtue of the authority vested in me by R. S. 4405, as amended, 46 U. S. C. 375, and section 101, Reorganization Plan No. 3 of 1946, 11 F. R. 7875, as well as the statutes cited with the regulations below, the following regulations are pre-

scribed, which shall become effective on and after July 1, 1948:

Subchapter D—Tank Vessels

PART 34—FIRE-FIGHTING EQUIPMENT

INSPECTION OF FIRE-FIGHTING EQUIPMENT

Section 34.1-1 is amended by designating the first sentence paragraph (a) and by adding paragraphs (b), (c), and (d), which were formerly published in § 54.18-6 (b), (c), and (d), so that the section will read as follows:

§ 34.1-1 *Inspection of fire-fighting equipment; general—TB/ALL.* (a) At each annual inspection, and at any other time as required in the judgment of the Officer in Charge, Marine Inspection, all fire-fighting equipment on tank vessels shall be inspected.

(b) The examination of the fire-fighting equipment shall be made by inspectors. This applies to fire pumps, hose, chemical fire extinguishers, axes, and steam or gas smothering lines to cargo holds and compartments.

(c) The inspectors shall examine the fire-fighting equipment provided for the fireroom and engine room to ascertain if it conforms to the regulations in this subchapter and that it is in good condition for immediate use.

(d) At the annual inspection or periodical reinspections, the inspectors shall examine the water-sprinkling system, when fitted, to ascertain if it is in good condition and ready for immediate use. (R. S. 4405, 4417a, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 375, 391a, 50 U. S. C. 1275; and section 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.)

Subchapter F—Marine Engineering

Parts 50 to 57, inclusive, are amended as set forth below. The following tables indicate the relationship between the old and new numbering systems.

COMPARISON OF OLD SECTION NUMBERS WITH NEW SECTION NUMBERS

[The asterisk (*) after number indicates change in text]

Old numbers	New numbers	Old numbers	New numbers
50.1	50.05	51.4-5	51.07-20
50.2	50.10	51.4-6	51.07-25
51.1-1	51.01-1	51.4-7	51.07-30
51.1-2	51.01-5	51.4-8	51.07-35
51.1-3	51.01-10	51.4-9	51.07-40
51.1-4	51.01-15	51.4-10	51.07-45
51.1-5	51.01-20	51.5-1*	51.10-1
51.1-6	51.01-25	51.5-2*	51.10-5
51.1-7	51.01-30	51.5-3*	51.10-10
51.1-8	51.01-35	51.5-4*	51.10-15
51.1-9	51.01-40	51.5-5*	51.10-20
51.1-10	51.01-45	51.5-6*	51.10-25
51.1-11	51.01-50	51.5-7*	51.10-30
51.1-12	51.01-55	51.5-8*	51.10-35
51.1-13*	51.01-60	51.5-9*	51.10-40
51.1-14	51.01-65	51.5-10*	51.10-45
51.1-15	51.01-70	51.6-1	51.13-1
51.1-16	51.01-75	51.6-2	51.13-5
51.1-17	51.01-80	51.6-3	51.13-10
51.1-18	51.01-85	51.6-4	51.13-15
51.2-1*	51.04-1	51.6-5	51.13-20
51.2-1*	51.04-5	51.6-6	51.13-25
51.2-1*	51.04-10	51.6-7	51.13-30
51.2-2*	51.04-15	51.6-8	51.13-35
51.2-3*	51.04-20	51.6-9	51.13-40
51.2-4*	51.04-25	51.6-10	51.13-45
51.2-5*	51.04-30	51.7-1	51.16-1
51.2-6*	51.04-35	51.7-2	51.16-5
51.2-7*	51.04-40	51.7-3	51.16-10
51.2-8*	51.04-45	51.7-4	51.16-15
51.2-9*	51.04-50	51.7-5	51.16-20
51.2-10*	51.04-55	51.7-6	51.16-25
51.4-1	51.07-1	51.7-7	51.16-30
51.4-2	51.07-5	51.7-8	51.16-35
51.4-3	51.07-10	51.7-9	51.16-40
51.4-4	51.07-15	51.8-1	51.19-1

COMPARISON OF OLD SECTION NUMBERS WITH NEW SECTION NUMBERS—Continued

[The asterisk (*) after number indicates change in text]

Old numbers	New numbers	Old numbers	New numbers
51.8-2	51.19-5	51.11b-12*	51.40-55
51.8-3	51.19-10	51.11b-13*	51.40-60
51.8-4	51.19-15	51.11b-14*	51.40-65
51.8-5	51.19-20	51.11b-15*	51.40-70
51.8-6	51.19-25	51.11b-16*	51.40-75
51.8-7	51.19-30	51.11b-17*	51.40-80
51.8-8	51.19-35	51.11b-18*	51.40-85
51.8-9	51.19-40	51.11b-19*	51.40-90
51.8-10	51.19-45	51.12-1*	51.43-1
51.8-11	51.19-50		51.43-5
51.9-1*	51.25-1	51.12-1a*	51.43-10
51.9-2*	51.25-5	51.12-2*	51.43-15
51.9-3*	51.25-10	51.12-3*	51.43-20
51.9-4*	51.25-15	51.12-4*	51.43-25
51.9-5*	51.25-20	51.12-5*	51.43-30
51.9-6*	51.25-25	51.12-6*	51.43-35
51.9-7*	51.25-30	51.12-7*	51.43-40
51.9-8*	51.25-35	51.12-8*	51.43-45
51.9-9*	51.25-40	51.12-9*	51.43-55
51.9-10*	51.25-45	51.13-1*	51.70-1
51.9-11*	51.25-50	51.13-2*	51.70-5
51.9-12*	51.25-55	51.13-3*	51.70-10
51.9-13*	51.25-60	51.13-4*	51.70-15
51.9-14*	51.25-65	51.13-5*	51.70-20
51.9-15*	51.25-70	51.13-6*	51.70-25
51.9-16*	51.25-75	51.13-7*	51.70-30
51.9a-1*	51.28-1	51.13-8*	
51.9a-2*	51.28-5	51.13-9*	51.70-35
51.9a-3*	51.28-10	51.13-10*	51.70-40
51.9a-4*	51.28-15	51.13-11*	51.70-45
51.9a-5*	51.28-20	51.13-12*	51.70-50
51.9a-6*	51.28-25	51.13-13*	51.70-55
51.9a-7*	51.28-30	51.13-14*	51.70-60
51.9a-8*	51.28-35	51.14-1*	51.73-1
51.9a-9*	51.28-40	51.14-2*	51.73-5
51.9a-10*	51.28-45	51.14-3*	51.73-10
51.9a-11*	51.28-50	51.14-4*	51.73-15
51.9a-12*	51.28-55	51.14-5*	51.73-20
51.9a-13*	51.28-60	51.14-6*	51.73-25
51.9a-14*	51.28-65	51.14-7*	51.73-30
51.9a-15*	51.28-70	51.14-8*	51.73-35
51.9a-16*	51.28-75	51.14-9*	51.73-40
51.9a-17*	51.28-80	51.14-10*	51.73-45
51.9a-18*	51.28-85	51.15-1*	51.46-1
51.10-1*	51.31-1	51.15-2*	51.46-5
51.10-2*	51.31-5	51.15-3*	51.46-10
51.10-3*	51.31-10	51.15-4*	51.46-15
51.10-4*	51.31-15	51.15-5*	51.46-20
51.10-5*	51.31-20	51.15-6*	51.46-25
51.10-6*	51.31-25	51.15-7*	51.46-30
51.10-7*	51.31-30	51.15-8*	51.46-35
51.10-8*	51.31-35	51.15-9*	51.46-40
51.10-9*	51.31-40	51.15-10*	51.46-45
51.10-10*	51.31-45	51.15-11*	51.46-50
51.10-11*	51.31-50	51.15-12*	51.46-55
51.10-12*	51.31-55	51.15-13*	51.46-60
51.10-13*	51.31-60	51.15-14*	51.46-65
51.10-14*	51.31-65	51.16-1*	51.49-1
51.10-15*	51.31-70	51.16-2*	51.49-5
51.10-16*	51.31-75	51.16-3*	51.49-15
51.10-17*	51.31-80	51.16-4*	51.49-20
51.10-18*	51.31-85	51.16-5*	51.49-25
51.11-1*	51.34-1	51.16-6*	51.49-30
51.11-2*	51.34-5	51.16-7*	51.49-35
51.11-3*	51.34-10	51.16-8*	51.49-40
51.11-4*	51.34-15		51.49-50
51.11-5*	51.34-20	(1)	51.52-1
51.11-6*	51.34-25	(1)	51.52-5
51.11-7*	51.34-30	(1)	51.52-10
51.11-8*	51.34-35	(1)	51.52-15
	51.34-40	(1)	51.52-20
	51.34-45	(1)	51.52-25
51.11-9*	51.34-50	(1)	51.52-30
51.11a-1*	51.37-1	(1)	51.52-35
51.11a-2*	51.37-5	(1)	51.52-40
51.11a-3*	51.37-10	(1)	51.52-45
51.11a-4*	51.37-15	(1)	51.52-50
51.11a-5*	51.37-20	(1)	51.52-55
51.11a-6*	51.37-25	(1)	51.52-60
51.11a-7*	51.37-30	51.16a-1*	51.55-1
51.11a-8*	51.37-35	51.16a-2*	51.55-5
51.11a-9*	51.37-40	51.16a-3*	51.55-10
51.11a-10*	51.37-45	51.16a-4*	51.55-15
51.11a-11*	51.37-50	51.16a-5*	51.55-20
51.11a-12*	51.37-55	51.16a-6*	51.55-25
51.11a-13*	51.37-60	51.16a-7*	51.55-30
51.11a-14*	51.37-65	51.16a-8*	51.55-35
51.11a-15*	51.37-70	51.16a-9*	51.55-40
51.11a-16*	51.37-75	51.17-1*	51.58-1
51.11a-17*	51.37-80	51.17-2*	51.58-5
51.11a-18*	51.37-85	51.17-3*	51.58-10
51.11a-19*	51.37-90	51.17-4*	51.58-15
51.11b-1*	51.40-1	51.17-5*	51.58-20
51.11b-2*	51.40-5	51.17-6*	51.58-25
51.11b-3*	51.40-10	51.17-7*	51.58-30
51.11b-4*	51.40-15	51.17-8*	51.58-35
51.11b-5*	51.40-20	51.17-9*	51.58-40
51.11b-6*	51.40-25	51.17-10*	51.58-45
51.11b-7*	51.40-30	51.17-11*	51.58-50
51.11b-8*	51.40-35	51.17-12*	51.58-55
51.11b-9*	51.40-40	51.17-13*	51.58-60
51.11b-10*	51.40-45	51.18-1	51.64-1
51.11b-11*	51.40-50	51.18-2	51.64-5
		51.18-3	51.64-10

1 New specification added which was not previously included in the Code of Federal Regulations.

COMPARISON OF OLD SECTION NUMBERS WITH
NEW SECTION NUMBERS—Continued

[The asterisk (*) after number indicates change in text]

Old numbers	New numbers	Old numbers	New numbers
51.18-4	51.64-15	52.4-2	52.15-5
51.18-5	51.64-20	52.4-3	52.15-10
51.18-6	51.64-25	52.4-4	52.15-15
51.18-7	51.64-30	52.5-1*	52.20-1
51.18-8	51.64-35	52.5-2	52.20-5
51.18-9	51.64-40	52.5-3*	52.20-10
51.18-10	51.64-45	52.6-1	52.25-1
51.18-11	51.64-50	52.6-2	52.25-5
51.19-1*	51.61-1	52.6-3*	52.25-10
51.19-2*	51.61-5	52.6-4*	52.25-15
51.19-3*	51.61-10	52.7-1	52.30-1
51.19-4*	51.61-15	52.7-2	52.30-5
51.19-5*	51.61-20	52.7-3	52.30-10
51.19-6*	51.61-25	52.8-1	52.35-1
51.19-7*	51.61-30	52.8-2	52.35-5
51.19-8*	51.61-35	52.8-3	52.35-10
51.19-9*	51.61-40	52.8-4	52.35-15
51.19-10*	51.61-45	52.8-5	52.35-20
51.19-11*	51.61-1	52.9-1	52.40-1
51.19-12*	51.61-1	52.9-2	52.40-5
51.19-13*	51.61-10	52.9-3	52.40-10
51.19-14*	51.61-15	52.10-1	52.45-1
51.19-15*		52.10-2	52.45-5
51.19-16*	51.61-35	52.10-3	52.45-10
51.19-17*	51.61-40	52.10-4	52.45-15
(i)	51.67-1	52.11-1	52.50-1
(j)	51.67-5	52.11-2	52.50-5
(k)	51.67-10	52.11-3	52.50-10
(l)	51.67-15	52.11-4	52.50-15
(m)	51.67-20	52.12-1	52.55-1
(n)	51.67-25	52.12-2	52.55-5
(o)	51.67-30	52.12-3	52.55-10
(p)	51.67-35	52.12-4	52.55-15
(q)	51.67-40	52.13-1	52.60-1
51.20-1*	51.70-1	52.13-2	52.60-5
51.20-2*	51.70-5	52.13-3	52.60-10
51.20-3*	51.70-10	52.13-4	52.60-15
51.20-4*	51.70-15	52.13-5*	52.60-20
51.20-5*	51.70-20		52.65-5
51.20-6*	51.70-25	52.14-1*	52.65-1
51.20-7*	51.70-30	52.14-2*	52.65-5
51.20-8*	51.70-35	52.14-3*	52.65-10
51.20-9*	51.70-40	52.14-4*	52.65-15
51.20-10*	51.70-45	52.14-5*	52.65-20
51.21-1*	51.22-1		54.01-30
51.21-2*	51.22-5		57.10-20
51.21-3*		52.14-6*	52.65-10
51.21-4*	51.22-10		54.01-35
51.21-5*	51.22-15	52.15-1	52.70-1
51.21-6*	51.22-20	52.15-2*	52.70-5
51.21-7*	51.22-25	52.15-3*	52.70-10
51.21-8*	51.22-30	52.15-4	52.70-15
51.21-9*	51.22-35	52.15-5	52.70-20
51.21-10*	51.22-40	52.15-6*	52.70-25
51.21-11*	51.22-45	52.15-7	52.70-30
51.21-12*	51.22-50	52.15-8*	52.70-35
51.21-13*		52.15-9	52.70-40
51.22-1*	51.22-5	52.15-10	52.70-45
51.22-2*	51.22-10	52.15-11*	52.70-50
51.22-3*	51.22-15	52.15-12	52.70-55
51.22-4*	51.22-20	52.16-1*	54.01-5
51.22-5*	51.22-25	52.16-2*	54.01-10
51.22-6*	51.22-30	52.16-3*	54.01-15
51.22-7*	51.22-35	52.16-4*	54.01-20
51.22-8*	51.22-40	52.16-5*	54.01-25
51.22-9*	51.22-45		54.01-30
51.22-10*	51.22-50	52.16-6*	54.01-35
51.22-11*			54.01-40
52.1-1*	52.01-1	52.16-7*	54.01-45
52.1-2*	52.01-5	53.17-1	57.05-5
52.1-3	52.01-10	53.17-2	57.05-10
52.1-4	52.01-15	53.17-3*	57.05-15
52.1-5	52.01-20	53.17-4	57.05-20
52.1-6*	52.01-25	54.18-1	57.10-1
52.1-7	52.01-30	54.18-2*	57.10-5
52.1-8	52.01-35	54.18-3	57.10-10
	53.01-1	54.18-4	57.10-15
52.1-9	52.01-40	54.18-5*	57.10-20
52.1-10	52.01-45	54.18-6	34.1-1, 64.21,
52.1-11	52.01-50		83.21, 101.21,
52.1-12	52.01-55		120.21
	54.01-60	54.18-7	63.11(g),
52.1-13	52.01-60		79.12(g),
52.1-14	52.01-65		97.14(g),
52.1-15	52.01-70		116.10(g)
52.1-16	52.01-75	54.18-8	57.10-21
52.1-17	52.01-80	54.18-9	57.10-25
52.1-18	52.01-85	54.18-10	64.22, 83.22,
52.2-1	52.05-1		101.22, 120.22
52.2-2	52.05-5	54.18-11	57.10-30
52.2-3	52.05-10	54.18-12	54.01-45
52.2-4	52.05-15	54.18-13	57.10-45
52.2-5	52.05-20	55.19-1	55.01-1
52.2-6	52.05-25	55.19-2*	55.01-5
52.2-7	52.05-30		55.01-10
52.3-1	52.10-1	55.19-3*	55.01-15
52.3-2	52.10-5		55.07-1
52.3-3	52.10-10		55.07-10
52.3-4	52.10-15	55.19-5*	55.07-25
52.3-5	52.10-20	55.19-6*	55.04-1
52.3-6	52.10-25		55.07-5
52.4-1	52.15-1	55.19-8*	55.07-15

* New specification added which was not previously included in the Code of Federal Regulations.

COMPARISON OF OLD SECTION NUMBERS WITH
NEW SECTION NUMBERS—Continued

[The asterisk (*) after number indicates change in text]

Old numbers	New numbers	Old numbers	New numbers
55.19-9*	55.07-20	57.21-3*	57.25-1,
55.19-10*	55.07-10,		57.25-5,
	55.07-30		57.25-10,
55.19-11	55.04-5		57.25-15,
55.19-12	55.10-1		57.25-20,
55.19-13	55.10-5		57.25-25
55.19-14	55.10-25,	57.21-4*	57.15-1
	55.10-30,	57.21-5	57.15-15
	55.10-35	57.21-6	57.15-20
55.19-15	55.10-15,	57.21-7	57.15-25
	55.10-20	57.21-8	57.15-30
55.19-16	55.10-15	57.21-9	57.10-22,
55.19-17			57.10-23
56.20-1*	56.01-1	57.21-10	57.10-27
56.20-2*	56.01-5	57.21-11	57.10-30
	56.01-15	57.21-12	57.10-35
56.20-3*	56.01-10	57.21-13	57.10-40
56.20-3a*	56.01-20	57.21-14	57.10-45
56.20-4*	56.01-25	57.21-15	57.10-50
56.20-5*	56.05-5	57.21-16	57.10-55
56.20-6*	56.01-30	57.21-17	57.05-20
56.20-7*	56.01-35	57.21-18*	54.01-15
56.20-8*	56.01-40	57.21-19*	56.10-10
56.20-9*	56.01-50	57.21-20*	56.10-15
56.20-10*	56.01-60	57.21-21*	56.10-20
56.20-11			56.10-25
56.20-12*	56.01-60,	57.21-22*	56.10-30
	56.01-65,	57.21-23*	54.01-40
	56.05-1	57.21-24	53.05-1
56.20-13*	56.01-70	57.21-25	53.05-5
56.20-14*	56.05-10	57.21-26	53.05-10
56.20-15*	56.05-15	57.21-27	53.05-15
56.20-16*	56.01-75	57.21-28	53.05-20
56.20-19*	56.01-80	57.21-29	53.05-25
57.21-1*	57.20-1	57.21-30	53.05-30
57.21-2*	57.20-5,	57.21-31	53.05-35
	57.20-10,	57.21-32	53.05-40
	57.20-15	57.21-33	53.05-45

COMPARISON OF NEW SECTION NUMBERS WITH
OLD SECTION NUMBERS

[The asterisk (*) after number indicates change in text]

New numbers	Old numbers	New numbers	Old numbers
50.01	-----	51.13-5	51.6-2
50.05*	50.1	51.13-10	51.6-3
50.10	50.2	51.13-15	51.6-4
51.01-1	51.1-1	51.13-20	51.6-5
51.01-5	51.1-2	51.13-25	51.6-6
51.01-10	51.1-3	51.13-30	51.6-7
51.01-15	51.1-4	51.13-35	51.6-8
51.01-20	51.1-5	51.13-40	51.6-9
51.01-25	51.1-6	51.13-45	51.6-10
51.01-30	51.1-7	51.16-1	51.7-1
51.01-35	51.1-8	51.16-5	51.7-2
51.01-40	51.1-9	51.16-10	51.7-3
51.01-45	51.1-10	51.16-15	51.7-4
51.01-50	51.1-11	51.16-20	51.7-5
51.01-55	51.1-12	51.16-25	51.7-6
51.01-60	51.1-13	51.16-30	51.7-7
51.01-65	51.1-14	51.16-35	51.7-8
51.01-70	51.1-15	51.16-40	51.7-9
51.01-75	51.1-16	51.19-1	51.8-1
51.01-80	51.1-17	51.19-5	51.8-2
51.01-85	51.1-18	51.19-10	51.8-3
51.04-1*	51.2-1	51.19-15	51.8-4
51.04-5*	51.2-1	51.19-20	51.8-5
51.04-10*	51.2-1	51.19-25	51.8-6
51.04-15*	51.2-2	51.19-30	51.8-7
51.04-20	51.2-3, 51.2-4	51.19-35	51.8-8
51.04-25*		51.19-40	51.8-9
51.04-30*	51.2-5	51.19-45	51.8-10
51.04-35*	51.2-6	51.19-50	51.8-11
51.04-40*	51.2-7	51.22-1*	51.21-1
51.04-45*	51.2-8		51.22-1
51.04-50*	51.2-9	51.22-5*	51.21-2
51.07-1	51.4-1	51.22-10*	51.21-4
51.07-5	51.4-2	51.22-15*	51.21-5
51.07-10	51.4-3		51.21-6
51.07-15	51.4-4		51.21-7
51.07-20	51.4-5	51.22-20*	51.21-7
51.07-25	51.4-6		51.22-5
51.07-30	51.4-7	51.22-25*	51.21-8
51.07-35	51.4-8	51.22-30*	51.22-6
51.07-40	51.4-9		51.22-7
51.07-45	51.4-10	51.22-35*	51.21-9
51.10-1*	51.5-1		51.22-7
51.10-5*	51.5-2	51.22-40*	51.21-10
51.10-10*	51.5-3		51.22-8
51.10-15*	51.5-4	51.22-45*	51.21-11
51.10-20*	51.5-5		51.22-9
51.10-25*	51.5-6	51.22-50*	51.21-12
51.10-30*	51.5-7		51.22-10
51.10-35*	51.5-8	51.25-1*	51.9-1
51.10-40*	51.5-9	51.25-5*	51.9-2
51.10-45	51.5-10		51.9-3
51.13-1	51.6-1		

COMPARISON OF NEW SECTION NUMBERS WITH
OLD SECTION NUMBERS—Continued

[The asterisk (*) after number indicates change in text]

New numbers	Old numbers	New numbers	Old numbers
51.25-15*	51.9-4	51.43-25*	51.12-4
51.25-20*	51.9-5	51.43-30*	51.12-5
51.25-25*	51.9-6	51.43-35*	51.12-6
51.25-30*	51.9-7	51.43-40*	51.12-7
51.25-35*	51.9-8	51.43-45*	51.12-8
51.25-40*	51.9-9	51.43-50*	
51.25-45*	51.9-10	51.43-55*	51.12-9
51.25-50*	51.9-11	51.46-1*	51.15-1
51.25-55*	51.9-12	51.46-5*	51.15-2
51.25-60*	51.9-13	51.46-10*	51.15-3
51.25-65*	51.9-14	51.46-15*	51.15-4
51.25-70*	51.1-15	51.46-20*	51.15-5
51.25-75*	51.9-16	51.46-25*	51.15-6
51.28-1*	51.9a-1	51.46-30*	51.15-7
51.28-5*	51.9a-2	51.46-35*	51.15-8
51.28-10*	51.9a-3	51.46-40*	51.15-9
51.28-15*	51.9a-4	51.46-45*	51.15-10
51.28-20*	51.9a-5	51.46-50*	51.15-11
51.28-25*	51.9a-6	51.46-55*	51.15-12
51.28-30*	51.9a-7	51.46-60*	51.15-13
51.28-35*	51.9a-8	51.46-65*	51.15-14
51.28-40*	51.9a-9	51.49-1*	51.16-1
51.28-45*	51.9a-10	51.49-5*	51.16-2
51.28-50*	51.9a-11	51.49-10*	
51.28-55*	51.9a-12	51.49-15*	51.16-3
51.28-60*		51.49-20*	51.16-4
51.28-65*	51.9a-13	51.49-25*	51.16-5
51.28-70*	51.9a-14	51.49-30*	51.16-6
51.28-75*	51.9a-15	51.49-35*	
51.28-80*	51.9a-16	51.49-40*	
51.28-85*	51.9a-17	51.49-45*	51.16-7
51.31-1*	51.9a-18	51.49-50*	51.16-8
51.31-1*	51.10-1	51.49-55*	
51.31-5*	51.10-2	51.49-60*	
51.31-10*	51.10-3	51.52-1*	
51.31-15*	51.10-4	51.52-5*	
51.31-20*	51.10-5	51.52-10*	
51.31-25*	51.10-6	51.52-15*	
51.31-30*	51.10-7	51.52-20*	
51.31-35*	51.10-8	51.52-25*	
51.31-40*	51.10-9	51.52-30*	
51.31-45*	51.10-10	51.52-35*	
51.31-50*	51.10-11	51.52-40*	
51.31-55*	51.10-12	51.52-45*	
51.31-60*	51.10-13	51.52-50*	
51.31-65*	51.10-14	51.52-55*	
51.31-70*	51.10-15	51.52-60*	
51.31-75*	51.10-16	51.55-1*	51.16a-1
51.31-80*	51.10-17	51.55-5*	51.16a-2
51.31-85*	51.10-18	51.55-10*	51.16a-3
51.34-1*	51.11-1	51.55-15*	51.16a-4
51.34-5*	51.11-2	51.55-20*	51.16a-5
51.34-10*	51.11-3	51.55-25*	51.16a-6
51.34-15*	51.11-4	51.55-30*	51.16a-7
51.34-20*	51.11-5	51.55-35*	51.16a-8
51.34-25*	51.11-6	51.55-40*	
51.34-30*	51.11-7	51.55-45*	51.16a-9
51.34-35*	51.11-8 (a)	51.58-1*	51.17-1
51.34-40*	51.11-8 (b)	51.58-5*	51.17-2
51.34-45*	51.11-8 (c)	51.58-10*	51.17-3
51.34-50*	51.11-9	51.58-15*	51.17-4
51.37-1*	51.11a-1	51.58-20*	51.17-5
51.37-5*	51.11a-2	51.58-25*	51.17-6
51.37-10*	51.11a-3	51.58-30*	51.17-7
51.37-15*	51.11a-4	51.58-35*	51.17-8
51.37-20*	51.11a-5	51.58-40*	51.17-9
51.37-25*	51.11a-6	51.58-45*	51.17-10
51.37-30*	51.11a-7	51.58-50*	51.17-11
51.37-35*	51.11a-8	51.58-55*	51.17-12
51.37-40*	51.11a-9	51.58-60*	51.17-13
51.37-45*	51.11a-10	51.61-1*	51.19-11
51.37-50*	51.11a-11		51.19-12
51.37-55*	51.11a-12		51.19-1
51.37-60*	51.11a-13	51.61-5*	51.19-2
51.37-65*	51.11a-14	51.61-10*	51.19-3
51.37-70*	51.11a-15		51.19-13
51.37-75*	51.11a-16	51.61-15*	51.19-4
51.37-80*	51.11a-17		51.19-14
51.37-85*	51.11a-18	51.61-20*	51.19-5
51.37-90*	51.11a-19	51.61-25*	51.19-6
51.40-1*	51.11b-1	51.61-30*	51.19-7
51.40-5*	51.11b-2	51.61-35*	51.19-8
51.40-10*	51.11b-3		51.19-16
51.40-15*	51.11b-4	51.61-40*	51.19-9
51.40-20*	51.11b-5		51.19-17
51.40-25*	51.11b-6	51.61-45*	51.19-10
51.40-30*	51.11b-7	51.64-1	51.18-1
51.40-35*	51.11b-8	51.64-5	51.18-2
51.40-40*	51.11b-9	51.64-10	51.18-3
51.40-45*	51.11b-10	51.64-15	51.18-4
51.40-50*	51.11b-11	51.64-20	51.18-5
51.40-55*	51.11b-12	51.64-25	51.18-6
51.40-60*	51.11b-13	51.64-30	51.18-7
51.40-65*	51.11b-14	51.64-35	51.18-8
51.40-70*	51.11b-15	51.64-40	51.18-9
51.40-75*	51.11b-16	51.64-45	51.18-10
51.40-80*	51.11b-17	51.64-50	51.18-11
51.40-85*	51.11b-18	51.67-1*	
51.40-90*	51.11b-19	51.67-5*	
51.43-1*	51.12-1	51.67-10*	
51.43-5*	51.12-1	51.67-15*	
51.43-10*	51.12-1a	51.67-20*	
51.43-15*	51.12-2	51.67-25*	
51.43-20*	51.12-3	51.67-30*	

COMPARISON OF NEW SECTION NUMBERS WITH
OLD SECTION NUMBERS—Continued

The asterisk (*) after number indicates change in text

New numbers	Old numbers	New numbers	Old numbers
51.67-35*		52.60-15	52.13-4
51.67-40*		52.60-20*	52.13-5
51.70-1*	51.13-1	52.65-1*	52.14-1
51.70-5*	51.13-2	52.65-5*	52.13-5 (b),
51.70-10*	51.13-3		52.14-2
51.70-15*	51.13-4	52.65-10*	52.14-3,
51.70-20*	51.13-5		52.14-5,
51.70-25*	51.13-6		52.14-6
51.70-30*	51.13-7	52.65-15*	52.14-4
51.70-35*	51.13-9	52.70-1*	52.15-1
51.70-40*	51.13-10	52.70-5*	52.15-2
51.70-45*	51.13-11	52.70-10*	52.15-3,
51.70-50*	51.13-12		55.19-10
51.70-55*	51.13-13	52.70-15	52.15-4
51.70-60*	51.13-14	52.70-20	52.15-5
51.73-1*	51.14-1	52.70-25*	52.15-6
51.73-5*	51.14-2	52.70-30	52.15-7
51.73-10*	51.14-3	52.70-35*	52.15-8
51.73-15*	51.14-4	52.70-40	52.15-9
51.73-20*	51.14-5	52.70-45	52.15-10
51.73-25*	51.14-6	52.70-50*	52.15-11
51.73-30*	51.14-7	52.70-55	52.15-12
51.73-35*	51.14-8	53.01-1*	52.1-8 (b)
51.73-40*	51.14-9	53.05-1	57.21-24
51.73-45*	51.14-10	53.05-5	57.21-25
51.73-50*		53.05-10	57.21-26
51.76-1	51.20-1	53.05-15	57.21-27
51.76-5*	51.20-2	53.05-20	57.21-28
51.76-10*	51.20-3	53.05-25	57.21-29
51.76-15*	51.20-4	53.05-30	57.21-30
51.76-20*	51.20-5	53.05-35	57.21-31
51.76-25*	51.20-6	53.05-40	57.21-32
51.76-30*	51.20-7	53.05-45	57.21-33
51.76-35*	51.20-8	54.01-1	52.16-1
51.76-40*	51.20-9	54.01-5*	52.16-2
51.76-45*	51.20-10	54.01-10*	57.21-18
52.01-1*	52.1-1		52.16-3,
52.01-5*	52.1-2	54.01-15*	57.21-18
52.01-10	52.1-3		52.16-4
52.01-15	52.1-4	54.01-20*	52.16-5
52.01-20	52.1-5	54.01-25*	52.16-6
52.01-25*	52.1-6	54.01-30	52.16-7
52.01-30	52.1-7	54.01-35	52.16-8
52.01-35	52.1-8	54.01-40*	57.21-23
52.01-40	52.1-9		54.18-12
52.01-45*	52.1-10	54.01-45*	52.1-12
52.01-55	52.1-11	54.01-50	52.16-5
52.01-60	52.1-12	54.01-55*	55.19-1
52.01-65	52.1-13	55.01-1	55.19-2 (b) (c)
52.01-70	52.1-14	55.01-5*	55.19-2 (a)
52.01-75	52.1-15	55.01-10*	55.19-3 (a)
52.01-80	52.1-16	55.01-15*	55.19-3 (b)
52.01-85	52.1-17	55.04-1*	55.19-11 (a)
52.01-90	52.1-18	55.04-5	55.19-3 (b)-
52.05-1	52.2-1	55.07-1*	(m)
52.05-5	52.2-2		55.19-6 (b)
52.05-10	52.2-3	55.07-5*	55.19-3 (n)-
52.05-15	52.2-4	55.07-10*	(s)
52.05-20	52.2-5		55.19-8
52.05-25	52.2-6	55.07-15*	55.19-9
52.05-30	52.2-7	55.07-20*	55.19-10
52.05-35	52.2-8	55.07-25*	55.19-11
52.05-40	52.2-9	55.07-30*	55.19-12
52.05-45	52.2-10	55.10-1	55.19-13
52.05-50	52.2-11	55.10-5	55.19-14
52.05-55	52.2-12	55.10-10	55.19-15
52.05-60	52.2-13	55.10-15	55.19-16
52.05-65	52.2-14		55.19-17
52.05-70	52.2-15	55.10-20	55.19-18
52.05-75	52.2-16	55.10-25	55.19-19
52.05-80	52.2-17	55.10-30	55.19-20
52.05-85	52.2-18	55.10-35	55.19-21
52.05-90	52.2-19	56.01-1*	56.20-12
52.05-95	52.2-20	56.01-5*	56.20-2
52.06-1	52.3-1	56.01-10*	56.20-3
52.06-5	52.3-2	56.01-15*	56.20-2 (b)
52.06-10	52.3-3	56.01-20*	56.20-3a
52.06-15	52.3-4	56.01-25*	56.20-4
52.06-20	52.3-5	56.01-30*	56.20-6
52.06-25	52.3-6	56.01-35*	56.20-7
52.06-30	52.3-7	56.01-40*	56.20-8,
52.06-35	52.3-8		57.21-23
52.06-40	52.3-9	56.01-45	56.20-9
52.06-45	52.3-10	56.01-50*	56.20-10
52.06-50	52.3-11	56.01-55*	56.20-11
52.06-55	52.3-12	56.01-60*	56.20-12
52.06-60	52.3-13	56.01-65*	56.20-12 (s)
52.06-65	52.3-14	56.01-70*	56.20-13
52.06-70	52.3-15	56.01-75*	56.20-16
52.06-75	52.3-16	56.01-80*	56.20-19
52.06-80	52.3-17	56.05-1*	56.20-4,
52.06-85	52.3-18		56.20-12
52.06-90	52.3-19	56.05-5*	56.20-5
52.06-95	52.3-20	56.05-10*	56.20-14
52.07-1	52.3-21	56.05-15*	56.20-15
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PART 50—GENERAL PROVISIONS

Sec.

50.01 Basis and purpose of regulations.

50.05 Application of regulations.

50.10 Definition of terms.

AUTHORITY: §§ 50.01 to 50.10, inclusive, issued under R. S. 4405, 4417a, 4418, 4426, 4427, 4429, 4430, 4431, 4432, 4433, 4434, 4453, and 4491, as amended, sec. 14, 29 Stat. 690, 41 Stat. 305, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 363, 366, 367, 375, 391a, 392, 404, 405, 407, 408, 409, 410, 411, 412, 435, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.

§ 50.01 Basis and purpose of regulations. By virtue of the authority vested in the Commandant of the Coast Guard under section 101 of the Reorganization Plan No. 3 of 1946 (11 F. R. 7875), R. S. 4405, 4417a, 4418, 4426, 4427, 4429, 4430, 4431, 4432, 4433, 4434, 4453, and 4491, as amended, section 14, act of March 3, 1897, act of October 25, 1919, act of June 20, 1936, act of June 12, 1940 and section 5 (e), act of June 6, 1941, as amended (46 U. S. C. 363, 366, 367, 375, 391a, 392, 404, 405, 407, 408, 409, 410, 411, 412, 435, 1333, 50 U. S. C. 1275), the regulations in this subchapter are prescribed for merchant vessels in accordance with the intent of the various statutes and to obtain their correct and uniform administration.

§ 50.05 Application of regulations. (a) The regulations in this subchapter contain specifications and requirements for materials, design, construction, installation and inspection of boilers, unfired pressure vessels, safety valves and appurtenances, including piping systems, upon the strength and efficiency of which safety of life is dependent.

(b) The regulations in Parts 50 to 57, inclusive, apply to installations contracted for or built on or after July 1, 1935. The regulations in Part 58 apply only to installations contracted for or built prior to July 1, 1935.

(c) The regulations in this subchapter are not retroactive in effect, except as provided in paragraph (d) of this section or if specifically provided for in the regulation at the time it is amended or added. The regulations amended or added subsequent to July 1, 1935, are applicable to installations contracted for or built on or after the effective date of such regulations, as amended or added.

(d) Where existing vessels are reboilered, the mountings and attachments, including feed and blow-off valves and fittings, shall be renewed in accordance with the regulations in Parts 50 to 57, inclusive, of this subchapter, in effect at the time such work is contracted for or built. The steam piping shall be gauged and examined by the Officer in Charge, Marine Inspection, and if found to be of the thickness required at the time the piping was installed it may be continued in use so long as the Officer in Charge, Marine Inspection, is of the opinion that the piping may be safely continued in use. Changes in specifications of articles of equipment shall not apply to such articles which have been passed as satisfactory until replacement shall become necessary.

§ 50.10 Definition of terms. Certain terms used in the regulations in this subchapter are defined as follows:

(a) **Commandant.** The term "Commandant" means the Commandant of the Coast Guard.

(b) **Coast Guard District Commander.** The term "Coast Guard District Commander" means an officer of the Coast Guard designated as such by the Commandant to command all Coast Guard activities within his district, which include the inspections, enforcement and administration of Title 52, R. S., and acts amendatory thereof or supplemental thereto, and rules and regulations thereunder.

(c) **Officer in Charge, Marine Inspection.** The terms "Officer in Charge, Marine Inspection," means any person from the civilian or military branch of the Coast Guard designated as such by the Commandant and who under the superintendence and direction of the Coast Guard District Commander is in charge of an inspection district for the performance of duties with respect to the inspections, enforcement, and administration of Title 52, R. S., and acts amendatory thereof or supplemental thereto, and rules and regulations thereunder.

(d) **Marine inspector or inspector.** The terms "marine inspector" or "inspector" mean any person from the civilian or military branch of the Coast Guard assigned under the superintendence and direction of an Officer in Charge, Marine Inspection, or any other person as may be designated for the performance of duties with respect to the inspections, enforcement, and the administration of Title 52, R. S., and acts amendatory thereof or supplemental thereto, and rules and regulations thereunder.

(e) **Requirements.** The term "requirements" refers to process of manufacture, characteristic, physical and chemical properties, tests, workmanship, and finish of materials.

(f) **Headquarters.** The term "headquarters" means the Office of the Commandant, United States Coast Guard, Washington 25, D. C.

PART 51—MATERIALS

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- 51.58-30 Hydrostatic tests.
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- 51.67-1 Scope.
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- 51.70-10 Temper.
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- 51.70-20 Sampling for chemical analysis.
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- 51.73-30 Bending properties.
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AUTHORITY: §§ 51.01-1 to 51.76-45, inclusive, issued under R. S. 4405, 4417a, 4418, 4426, 4427, 4429, 4430, 4431, 4432, 4433, 4434, 4453, and 4491, as amended, sec. 14, 29 Stat. 690, 41 Stat. 305, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 363, 366, 367, 375, 391a, 392, 404, 405, 407, 408 409, 410, 411, 412, 435, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.

SUBPART 51.01—GENERAL

§ 51.01-1 *Statutory requirements.* (a) Plates, bars, and shapes used as pressure parts of boilers intended for marine service shall be tested, inspected, and stamped by an inspector in accordance with the requirements of Title 52 of the Revised Statutes of the United States.

(b) Material used for pressure parts in the construction of pressure vessels other than boilers shall conform to the requirements of this part. Unfired pressure vessels designed for maximum allowable pressures not exceeding 700 pounds per square inch and temperatures not exceeding 500° F. may be constructed of steel plate meeting the specifications of subpart 51.22: *Provided*, That such material is tested and stamped by the manufacturer. Plates for this purpose are not required to be tested and inspected, but may be accepted on the certification of the manufacturer as to their chemical and physical properties.

§ 51.01-5 *Basic information requirements.* When ordering material for the construction of boilers or unfired pressure vessels to be installed on vessels subject to the inspection of the Coast Guard, boiler manufacturers shall, as far as practicable, furnish the following information to the manufacturer of the material and to the Officer in Charge, Marine Inspection, in the district where the boiler or unfired pressure vessel is to be fabricated:

(a) Name and location of manufacturer's works.

(b) Type and size of boiler or unfired pressure vessel.

(c) Manufacturer's serial or shop number.

(d) Design pressure.

(e) Name of shipyard and hull number.

(f) Vessel's name.

§ 51.01-10 *General classification of materials.* (a) The materials to be used in the construction of boilers and unfired pressure vessels, piping, valves, fittings, and appurtenances below listed shall be of three general classes of which classes A and B shall be used for pressure parts and class C may be used for other parts as specified.

Class A: Tested materials manufactured under the supervision of the Coast Guard, tests of which shall be witnessed by an inspector.

Class B: Certified materials tested by the manufacturers, and certified by them as conforming to the requirements.

Class C: Materials for nonpressure parts of boilers or unfired pressure vessels such as casings for water-tube boilers, uptakes, furnace fronts, and operating equipment shall be of good commercial quality. No detail requirements are herein specified for materials in this class. Class C materials shall be accepted by inspectors without requiring tests or certification by manufacturers.

(b) Except as may be otherwise required, the classification of materials under A and B and the sections of this part in which they are specified, are as follows:

CLASS A

Subpart

- 51.04 Marine boiler steel plate.
- 51.07 Staybolt steel.
- 51.10 Steel bars and shapes.
- 51.13 Wrought-iron bars for stays and staybolts.
- 51.16 Rivet steel.
- 51.19 Rivet iron.

CLASS B

- 51.22 Flange and firebox steel plates.
- 51.25 Lap-welded and seamless steel and lap-welded iron boiler tubes.
- 51.28 Electric-resistance-welded steel and open-hearth iron boiler and superheater tubes.
- 51.31 Seamless steel boiler tubes for high-pressure service.
- Medium-carbon seamless steel boiler and superheater tubes.
- Carbon-molybdenum alloy-steel boiler and superheater tubes.
- 51.34 Seamless steel pipe.
- 51.37 Welded and seamless steel pipe.
- 51.40 Electric-resistance-welded steel pipe.
- 51.43 Welded wrought-iron pipe.
- 51.46 Steel forgings.
- 51.49 Alloy-steel bolting material.
- 51.52 Carbon-steel bolting material.
- 51.55 Carbon and alloy-steel nuts for high-temperature service.
- 51.58 Steel castings.
- 51.61 Malleable iron castings.
- 51.64 Gray iron castings for valves, flanges and pipe fittings.
- 51.67 Copper-alloy plate.
- 51.70 Seamless brass pipe.
- 51.73 Seamless copper pipe.
- 51.76 Bronze castings.

§ 51.01-15 *Inspection and testing of Class A material.* Inspectors shall have free entry at all times to those parts of the works where material subject to the regulations in this part is being manu-

factured. The manufacturer shall afford inspectors all reasonable facilities to satisfy them that the material is being manufactured in accordance with the requirements of the Commandant. Unless otherwise authorized, tests and inspection shall be made at the place of manufacture prior to shipment and shall be so conducted as not to interfere unnecessarily with the operation of the works. Inspectors shall assure themselves that test specimens are marked for positive identification with the materials which they represent. Unless otherwise specified, tests shall be made at ordinary temperature.

§ 51.01-20 Chemical analyses. (a) A ladle analysis of each melt of class A materials shall be made by the manufacturer and a certified report thereof shall be furnished by him to the inspector upon request. This analysis shall be made from a test ingot taken during the pouring of the melt. The chemical composition thus determined shall conform to the specified requirements. This requirement shall apply also to the following class B materials:

- (1) Flange and firebox quality steel plates specified in subpart 51.22.
- (2) Steel forgings specified in subpart 51.46.
- (3) Alloy-steel bolting material specified in subpart 51.49.
- (4) Steel castings specified in subpart 51.58.
- (5) Copper-alloy plate specified in subpart 51.67.
- (6) Bronze castings specified in subpart 51.76.

(b) A check analysis may be made at the discretion of the Commandant from test specimens representing material for which chemical composition is specified in any section of this part, in either class A or B. The chemical composition thus determined shall conform to the requirements.

§ 51.01-25 Certification of class B material. (a) Certification of chemical analyses and physical tests of materials of class B shall be an affidavit by the manufacturer certifying that all materials of this class supplied by him for marine service do, or will conform to all the requirements of the regulations in this part applicable thereto.

(b) Materials in this class are not required to be tested in the presence of an inspector, but whenever deemed necessary by the Commandant, he may detail an inspector to witness such tests and satisfy himself that the requirements of the specification for class B materials are met.

§ 51.01-30 Tension tests. All tension tests shall be made on standard calibrated machines. The yield point in tension tests shall be determined by the drop of the beam or the halt in the gauge of the testing machine. Except where otherwise specified in part 51 of this chapter, the speed of the crosshead of the machine shall not exceed $\frac{1}{16}$ inch per minute per inch of gauge length up to the yield point, nor shall it exceed $\frac{1}{2}$ inch per minute per inch of gauge length beyond the yield point. Any convenient speed of the crosshead may be used from

the start of loading the test specimen until a value estimated as one-half of the yield point is reached. In determining the yield strength by use of an extensometer, the crosshead speed shall not exceed 0.025 inch per minute per inch of gauge length. In the event the machine is stopped in taking readings, the speed may be exceeded in the take up only. The ends of all test specimens shall be of form to fit the holders of the testing machine in such a way that the load will be axial.

§ 51.01-35 Test reports. Inspectors shall report the results of official tests on form CG 934. Duplicate copies thereof shall be forwarded by the Coast Guard District Commander in the district where the material was manufactured to the Coast Guard District Commander in the district where the material is to be fabricated.

§ 51.01-40 Retests. When the result of any of the physical tests specified for any of the materials does not conform to the requirements, two additional specimens may, at the request of the manufacturer, be taken from the same lot and tested in the manner specified, but in such case, both of the specimens shall conform to the requirements. In the case of tension tests, this retest shall be allowed if the percentage of elongation obtained is less than required, or if any part of the fracture is outside of the middle third of the gauge length. If any test specimen develops flaws, it shall be discarded and another specimen from the same lot substituted.

§ 51.01-45 Rejections. Failure of the tests (or retests) specified in the regulations in this subchapter for each particular material shall be cause for rejection. Unless otherwise required, any rejection shall be reported by the inspector within 5 working days from the receipt of the test specimen. Acceptance of material on results of tests at the place of manufacture shall not prejudice the right to reject any of such material in which injurious defects are subsequently discovered. The manufacturer shall be promptly notified of such subsequent rejections, and the records shall be corrected.

§ 51.01-50 Appeals. In case of dissatisfaction with the results of any test, the manufacturer may appeal to the Coast Guard District Commander from the decision of the Officer in Charge, Marine Inspection. Should the Coast Guard District Commander sustain the Officer in Charge, Marine Inspection, the manufacturer may appeal to the Commandant. Tested specimens which represent rejected material shall be retained for at least 30 days.

§ 51.01-55 Process of steel manufacture. Unless otherwise officially authorized by the Commandant, all wrought steel to be used in the construction of boilers or unfired pressure vessels to be installed on vessels shall be manufactured by the open-hearth, electric furnace, or crucible process.

§ 51.01-60 Stamping plates and specimens. (a) Class A plates shall be stamped by the manufacturer, before

they are tested, with his name or trademark, the word "Marine", the letter indicating the grade of the steel, and the minimum tensile strength of the plate per square inch of cross-sectional area expressed in thousands. Inspectors shall permit cutting a plate into two or more parts before testing, but each part shall be stamped or match-marked for identification before cutting. All plates accepted by the inspector as conforming to the requirements shall be stamped by him near the manufacturer's stamp with the official stamp of the Coast Guard, the initials of his name, and the serial number. All test specimens shall be ring-stamped or match-marked for identification before being detached. Plates shall be stamped lengthwise in two places on one long side about 18 inches from the edges at the corners. Each butt strap shall be stamped lengthwise of the plate about the middle of the strap.

(b) The impression of the official stamp of the Coast Guard for stamping plates and specimens shall be as shown below:

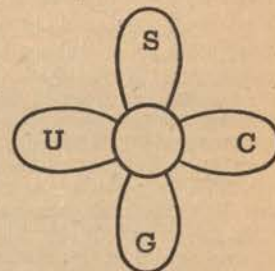


FIGURE 51.01-60 (b)—Official stamp.

§ 51.01-65 Stock plates. Plates may be ordered to be carried in stock ashore or on shipboard for repairs to boilers and unfired pressure vessels. Such plates shall be inspected and tested at the place of manufacture and stamped for identification as stock plates. A test report for such plates shall be furnished to the Coast Guard District Commander of the district where the purchaser is located, with a copy to the purchaser. The Coast Guard District Commander shall furnish a copy thereof to the Officer in Charge, Marine Inspection, in the district where the material is kept in stock, and if the material is to be used by persons other than the original purchaser, they shall also be furnished with a copy of such report, for submittal by them to the Officer in Charge, Marine Inspection, in the district where the repairs are actually to be made before the material may be used. Vessels carrying such stock plates shall obtain and carry identification and test records of each plate. Where such plates are cut into pieces for repairs, the Officer in Charge, Marine Inspection, shall, upon request, stamp each piece so detached for identification with the original plate and a record of such stamping shall be made.

§ 51.01-70 Workmanship and finish. All materials within the scope of the regulations in this subchapter shall be free from injurious defects and shall have a workmanlike finish.

§ 51.01-75 Heat treatment. Some of the materials herein specified require heat treatment. This may consist of an-

nealing, or of normalizing, or of normalizing followed by annealing, or of normalizing followed by a draw back to a temperature below the critical range. Annealing shall consist of allowing material to cool after forging or rolling to a temperature below the critical range, then reheating it to proper temperature to refine the grain and allowing it to cool in the furnace. Normalizing shall consist of allowing material to cool after forging or rolling to a temperature below the critical range, then reheating it to proper temperature to refine the grain and allowing it to cool in still air.

§ 51.01-80 *Reclassification of materials.* When more than one grade is specified for any material or purpose and tests of a material of a superior grade fail to meet the requirements, such material may be reclassified and accepted as a specified lower grade if it fulfills the specified requirements for the latter. In such cases, the material shall be restamped or re-marked as required for proper identification, and revised records shall be made to cover it.

§ 51.01-85 *Alternative materials.* If, in the development of industrial arts, other suitable or improved materials differing from those specified in this part are developed, their use will be given consideration, upon formal application to the Commandant with full information as to the characteristics of the material, and such scientific data and facts as may be necessary to establish the suitability and safety of the material for the use proposed. The material requirements in this subchapter are minimum requirements and are not intended to bar better materials.

SUBPART 51.04—MARINE BOILER STEEL PLATE

NOTE: In substantial agreement with A. S. T. M. Designation: A 201-46, A 212-46, and A 204-46.¹ Tested material—Class A.

§ 51.04-1 *Scope.* (a) There shall be seven grades of marine boiler steel plates, subject to class A inspection. These grades are designated A, B, C, D, E, F, and G. Grades A and B cover two ordinary tensile strength ranges in carbon-silicon steel plates; grades C and D cover two high tensile strength ranges in carbon-silicon steel plates; grades E, F, and G cover three high tensile strength ranges in carbon-molybdenum steel plates. All grades may be furnished in flange or firebox qualities. Plates of flange quality are limited in thickness to 2 inches. Plates of ordinary firebox quality are limited in thickness as fol-

lows: grade A to 12 inches; grade B to 6 inches; grades C and D, to 6 inches; grades E and F, to 6 inches; and grade G to 4 inches.

(b) Steel plates for any part of a boiler subject to pressure and exposed to the fire or products of combustion shall be of firebox quality; steel plates for any part of a boiler subject to pressure and not exposed to the fire or products of combustion shall be of flange or firebox quality.

(c) All of these grades may be arc or gas welded, but welding technique is of fundamental importance. Welding procedure shall be in accordance with Part 56 of this subchapter.

(d) Sufficient discard from the top of each ingot shall be made, at any stage of the manufacture, to secure freedom from piping and undue segregation in the finished product, but in no case shall the amount of top discard be less than 30 percent.

§ 51.04-5 *Process.* The steel shall be made by either or both of the following processes: open-hearth or electric furnace.

§ 51.04-10 *Heat treatment.* (a) Plates over 2 inches in thickness, before being fabricated, shall be uniformly heat-treated to produce grain refinement. Heat treatment involving quenching in a liquid medium is not permitted. If this treatment is not done at the rolling mill the testing shall be carried out in accordance with paragraph (d).

(b) When plates are heat-treated to produce grain refinement the test specimens and the plates shall be stamped "G. R." The tensile strength of the plates in the grain refined state shall be not less than the minimum of the specified range.

(c) (1) The purchaser shall indicate in his orders to the mill whether the rolling mill or the fabricator shall perform the required heat treatment of the plates.

(2) Orders to the plate manufacturer or the fabricator shall specify when plates subject to the requirements of this section are to be stress-relieved and when they are to be heat-treated for grain refinement so that proper provision may be made for the treatment of test specimens.

(d) When a fabricator is equipped to perform the work properly, and elects to do the required heat treatment of plates for grain refinement he shall accept the plates on the basis of the mill tests. The plate manufacturer shall make the tests prescribed in this specification, the tension and bend test specimens to be prepared from full thickness pieces heat-treated under conditions he considers appropriate for grain refinement and to meet the test requirements. The manufacturer shall inform the fabricator of the procedure followed in treating the pieces at the mill for guidance in treating the plates. The required physical properties shall be determined after heat treatment of the plates on specimens prepared from pieces similarly and simultaneously treated with the plates. Pieces for two tension tests, one top and one bottom, shall be provided from each plate as rolled. These pieces shall be stamped by the inspector with his official stamp for identification.

NOTE: The term "plate as rolled" used here and in §§ 51.04-35 (c) and 51.04-40 (a) refers to the unit plate rolled from a slab or directly from an ingot in its relation to the location and number of specimens; not to its condition.

(e) In the case of plates over 2 inches in thickness which subsequently are to be stress-relieved, the test specimens for such plates shall, before testing, be stress-relieved as specified in paragraph (a) following the heat treatment for grain refinement.

§ 51.04-15 *Chemical composition.* The steel shall conform to the following requirements as to chemical composition:

TABLE 51.04-15—CHEMICAL COMPOSITION

Chemical elements	Grades						
	A	B	C	D	E	F	G
Carbon, maximum, percent:							
For plates 1 inch and under in thickness	0.20	0.24	0.28	0.31	0.18	0.20	0.23
For plates over 1 to 2 inches, inclusive, in thickness	.24	.27	.31	.33	.21	.23	.26
For plates over 2 to 4 inches, inclusive, in thickness	.27	.30	.33	.35	.23	.25	.28
For plates over 4 to 6 inches, inclusive, in thickness	.31	.35	.33	.35	.25	.27	
For plates over 6 to 12 inches, inclusive, in thickness	.35						
Manganese, maximum, percent	.80	.80	.90	.90	.90	.90	.90
Phosphorus, maximum, percent:							
Flange	.04	.04	.04	.04	.04	.04	.04
Firebox	.035	.035	.035	.035	.035	.035	.035
Sulfur, maximum, percent:							
Flange	.05	.05	.05	.05	.05	.05	.05
Firebox	.04	.04	.04	.04	.04	.04	.04
Silicon, percent	.15	.15	.15	.15	.15	.15	.15
	to	to	to	to	to	to	to
	.30	.30	.30	.30	.30	.30	.30
Molybdenum, percent					.40	.40	.40
					to	to	to
					.60	.60	.60

¹ Copies of these A. S. T. M. specifications have been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

§ 51.04-20 *Tensile properties*—(a) *Grade A or B.* (1) The material shall conform to the following requirements as to tensile properties:

TABLE 51.04-20 (a) (1)—PHYSICAL PROPERTIES OF GRADE A OR B

Physical requirements	Grade A	Grade B
Tensile strength, p. s. i.	55,000 to 65,000	60,000 to 70,000
Yield point, minimum, p. s. i.	0.5 tens. str.	0.5 tens. str.
Elongation in 8 inches, minimum, percent:		
Flange.....	11,500,000 tens. str.	11,500,000 tens. str.
Firebox.....	11,550,000 tens. str.	11,550,000 tens. str.
Elongation in 2 inches, minimum percent; firebox ¹	1,750,000 tens. str.	1,750,000 tens. str.

¹ See § 51.04-20 (a) (4) and (6).

² See § 51.04-20 (a) (3).

³ When specimen shown in figure 51.04-35 (f) is used.

⁴ See § 51.04-20 (a) (5).

(2) Tensile strength only need be determined on the tension test specimen taken from the top of firebox plates, and it shall not exceed 67,000 p. s. i. for grade A, nor 72,000 p. s. i. for grade B.

(3) Should the formula in paragraph (a) (1) for minimum elongation in 8 inches for firebox steel give a value of less than 25 percent for grade A material or 23 percent for grade B material, the minimum allowable elongation shall be 25 and 23 percent for grades A and B, respectively, subject to the modifications of paragraph (a) (4).

(4) For material over $\frac{3}{4}$ inch in thickness, a deduction from the percentage of elongation in 8 inches specified in paragraphs (a) (1) and (3) of 0.125 percent shall be made for each increase of $\frac{1}{32}$ inch of the specified thickness above $\frac{3}{4}$ inch, to a minimum of 21 percent for flange steel and 22 percent for firebox steel of grade A; and 20 percent for flange steel and 21 percent for firebox steel of grade B.

(5) For material over $2\frac{1}{2}$ inches in thickness, a deduction from the percentage of elongation in 2 inches specified in paragraph (a) (1) of 0.5 percent shall be made for each increase of $\frac{1}{2}$ inch of the specified thickness above $2\frac{1}{2}$ inches. The minimum elongation for grade A shall be 15 percent.

(6) For material $\frac{1}{4}$ inch and under in thickness, the elongation shall be

measured on a gauge length of 24 times the thickness of the specimen and the elongation shall conform to the minimum requirement specified for the 8-inch gauge length.

(b) *Grades C and D.* (1) The material shall conform to the following requirements as to tensile properties:

TABLE 51.04-20 (b) (1)—PHYSICAL PROPERTIES OF GRADE C OR D

Physical requirements	Grade C	Grade D
Tensile strength, p. s. i.	65,000 to 77,000	70,000 to 82,000
Yield point, minimum, p. s. i.	0.5 tens. str.	0.5 tens. str.
Elongation in 8 inches, minimum, percent:		
Flange.....	11,550,000 tens. str.	11,550,000 tens. str.
Firebox.....	11,600,000 tens. str.	11,600,000 tens. str.
Elongation in 2 inches, minimum, percent; firebox ¹	1,750,000 tens. str.	1,750,000 tens. str.

¹ See § 51.04-20 (b) (3) and (5).

² See § 51.04-20 (b) (4).

(2) Tensile strength only need be determined on the tension test specimen taken from the top of firebox plates, and it shall not exceed 79,000 p. s. i. for grade C, nor 84,000 p. s. i. for grade D.

(3) For material over $\frac{3}{4}$ inch in thickness, a deduction from the percentage of elongation in 8 inches specified in paragraph (b) (1) of 0.125 percent shall be made for each increase of $\frac{1}{32}$ inch of the specified thickness above $\frac{3}{4}$ inch, to a minimum of 18 percent for flange steel and 19 percent for firebox steel.

(4) For material over $2\frac{1}{2}$ inches in thickness, a deduction from the percentage of elongation in 2 inches specified in paragraph (b) (1) of 0.5 percent shall be made for each increase of $\frac{1}{2}$ inch of the specified thickness above $2\frac{1}{2}$ inches.

(5) For material $\frac{1}{4}$ inch and under in thickness, the elongation shall be measured on a gauge length 24 times the thickness of the specimen, and the elongation shall conform to the minimum requirement specified for the 8-inch gauge length.

(c) *Grades E, F, and G.* (1) The material shall conform to the following requirements as to tensile properties:

TABLE 51.04-20 (c) (1)—PHYSICAL PROPERTIES OF GRADE E, F, OR G

Physical Requirements	Grade E	Grade F	Grade G
Tensile strength, p. s. i.	65,000 to 77,000	70,000 to 82,000	75,000 to 87,000
Yield point, minimum, p. s. i.	0.55 tens. str.	0.55 tens. str.	0.55 tens. str.
But in no case less than.....	37,000	40,000	43,000
Elongation in 8 inches, minimum, percent:			
Flange.....	11,600,000 tens. str.	11,600,000 tens. str.	11,600,000 tens. str.
Firebox.....	11,650,000 tens. str.	11,650,000 tens. str.	11,650,000 tens. str.
Elongation in 2 inches, minimum, percent; firebox ¹	1,750,000 tens. str.	1,750,000 tens. str.	1,750,000 tens. str.

¹ See § 51.04-20 (c) (3) and (6).

² When specimen shown in figure 51.04-35 (f) is used.

³ See section 51.04-20 (c) (5).

(2) Tensile strength only need be determined on the tension test specimen taken from the top of firebox plates, and it shall not exceed 80,000 p. s. i. for grade

E, 85,000 p. s. i. for grade F, and 90,000 p. s. i. for grade G.

(3) For plates over $\frac{3}{4}$ inch in thickness, a deduction from the percentage of

elongation in 8 inches prescribed in paragraph (c) (1) of 0.125 percent shall be made for each increase of $\frac{1}{32}$ inch of the specified thickness above $\frac{3}{4}$ inch, to a minimum of 19 percent for grades E and F, and 18 percent for grade G.

(4) For plates $\frac{3}{8}$ to $\frac{3}{4}$ inch, inclusive, in thickness, if the percentage of elongation of an 8-inch gauge length test specimen falls not more than 3 percent below the amount prescribed in paragraph (c) (1), the elongation shall be considered satisfactory provided the percentage of elongation in 2 inches across the break is not less than 30 percent.

NOTE: A characteristic of certain types of alloy steels is a local disproportionate increase in the degree of necking down or contraction of the specimens under tension test; resulting in a decrease in the percentage of elongation as the gauge length is increased. The effect is not so pronounced in the thicker plates.

(5) For plates over $2\frac{1}{2}$ inches in thickness, a deduction from the percentage of elongation in 2 inches prescribed in paragraph (c) (1) of 0.5 percent shall be made for each increase of $\frac{1}{2}$ inch of the specified thickness above $2\frac{1}{2}$ inches.

(6) For material $\frac{1}{4}$ inch and under in thickness, the elongation shall be measured on a gauge length 24 times the thickness of the specimen, and the elongation shall conform to the minimum requirement specified for the 8-inch gauge length.

§ 51.04-25 *Homogeneity test.* (a) The object of the homogeneity test, which is required for firebox steel only, is to open and render visible to the eye any seams due to failure to weld up or to interposed foreign matter, or any cavities due to gas bubbles in the ingot. The fractured surface of the test specimen shall not show any single seam or cavity more than $\frac{1}{4}$ inch in length for plates $\frac{3}{4}$ inch and under in thickness; nor more than $\frac{3}{8}$ inch in length for plates over $\frac{3}{4}$ to 4 inches, inclusive, in thickness; nor more than $\frac{1}{2}$ inch in length for plates 4 to 6 inches, inclusive, in thickness; nor more than $\frac{3}{4}$ inch in length for plates 6 to 12 inches, inclusive, in thickness, in any of the fractures obtained in accordance with paragraph (b). Each fracture shall be examined and the lengths of the seams and cavities determined, a pocket lens being used if necessary.

(b) The test may be made on a broken tension test specimen when an 8-inch gauge length specimen is used. For plates over 2 inches in thickness, the specimen shall be taken adjacent, side-wise, or lengthwise, to the top tension test specimen. For plates $\frac{3}{4}$ inch and under in thickness the specimen shall be nicked or grooved transversely, in three places, about $\frac{1}{16}$ inch deep. The first groove shall be 2 inches from the square end, and each succeeding groove on the opposite side about 2 inches from the preceding one. For plates over $\frac{3}{4}$ to $2\frac{1}{2}$ inches, inclusive, in thickness, the specimen may be grooved about $\frac{1}{8}$ inch deep, at one place on one side. For plates over $2\frac{1}{2}$ inches in thickness the specimen may be grooved at one place on both sides to leave a fracture which will include the horizontal axis of the plate and have a face at least 2 inches in depth. The

specimen shall be broken at each groove with a hammer or press. Where the press will not break the large specimen, the specimen may be split with a gas flame or by machining, and each section broken and examined.

§ 51.04-30 *Bending properties.* The bend test specimen shall stand being bent cold through 180° without cracking on the outside of the bent portion to an inside diameter which shall have the following relation to the thickness of the specimen. When the test is made on a specimen reduced in thickness, the rolled surface shall be on the outer curve of the bend.

TABLE 51.04-30—BENDING PROPERTIES

Thickness of material	Ratio of inside diameter of bend to thickness of specimen			
	Grade A	Grade B	Grade C	Grade D
1 inch and under	1/2	1	1 1/2	2
Over 1 to 1 1/2 inches, inclusive	1	1 1/2	2	2
Over 1 1/2 to 3 inches, inclusive	1 1/2	2	2	2 1/2
Over 3 to 4 inches, inclusive	2	2 1/2	2 1/2	3
Over 4 to 6 inches, inclusive	2 1/2	3	3	3 1/2
Over 6 to 9 inches, inclusive	3			
Over 9 to 12 inches, inclusive	3 1/2			

	Grade E	Grade F	Grade G
1 inch and under	1	1 1/2	2
Over 1 to 2 inches, inclusive	1 1/2	2	2 1/2
Over 2 to 4 inches, inclusive	1 1/2	2	3
Over 4 to 6 inches, inclusive	2	2 1/2	

§ 51.04-35 *Test specimens.* (a) For plates 2 inches and under in thickness the test specimens shall be prepared for testing from the material in its rolled condition.

(b) For plates over 2 inches in thickness the test specimens shall be prepared from the material in its heat-treated condition or from full thickness samples similarly and simultaneously treated. (See § 51.04-10 (a).)

(c) Tension test specimens for firebox steel shall be taken from the top and bottom corners of the plate as rolled (see note under § 51.04-10), parallel to its longitudinal axis, and for flange steel from the bottom corner of the plate only. Bend test specimens shall be taken from the middle of the top of the plate as rolled, at right angles to its longitudinal axis.

(d) For plates 2 inches and under in thickness, tension and bend test specimens shall be the full thickness of the material and shall be machined to the form and dimensions shown in figure 51.04-35 (d); or the bend test specimen may be machined with both edges parallel.

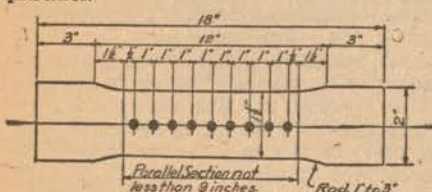


FIGURE 51.04-35 (d)—Standard rectangular tension-test specimen with 8-inch gauge length.

(e) For grade A or B plates up to 4 inches, inclusive, in thickness, tension-test specimens may be the full thickness of the material and of the form shown in figure 51.04-35 (d); when adequate testing machine capacity is available.

(f) For plates over 2 inches in thickness, except as permitted in paragraph (e), tension-test specimens shall be machined to the form and dimensions shown in figure 51.04-35 (f); and the axis of each such specimen shall be located midway between the center and the top or bottom surface of the plate. The bend test specimens shall be at least 1 1/2 inches in width, with both edges parallel, and may be reduced to 2 inches in thickness; but shall have one surface as rolled.

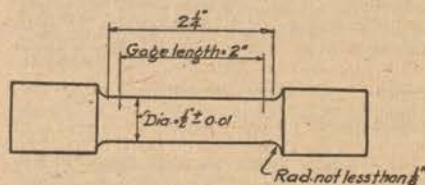


FIGURE 51.04-35 (f)—Standard round tension-test specimen with 2-inch gauge length.

NOTE: For simplicity of computation, it is recommended that the finished diameter of this test be made 0.505 inch, which is equivalent to 0.2 square inch in area.

(g) The sides of the bend test specimens may have the corners rounded to a radius not over 1/16 inch for plates 2 inches and under in thickness, and not over 1/8 inch for plates over 2 inches in thickness.

§ 51.04-40 *Number of tests.* (a) Two tension tests and one bend test shall be made from each firebox steel plate as rolled. One tension test and one bend test shall be made from each flange steel plate as rolled. (See note under § 51.04-10.)

(b) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(c) If the percentage of elongation of any tension test specimen is less than that specified in § 51.04-20 and any part of the fracture is more than 3/4 inch from the center of the gauge length of a 2-inch specimen or is outside the middle third of the gauge length of an 8-inch specimen, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

§ 51.04-45 *Permissible variations in thickness and weight.* No plate shall vary more than 0.01 inch under the thickness specified.

§ 51.04-50 *Finish.* The finished plates shall be free from injurious defects and shall have a workmanlike finish.

§ 51.04-55 *Marking.* The quality classification to be marked on all class A plates in accordance with § 51.01-60 shall be the word, "Marine" followed by the letter designating the grade of the steel.

SUBPART 51.07—STAYBOLT STEEL

NOTE: In substantial agreement with A. S. T. M. Designation: A 31-40.¹ Tested material—class A.

§ 51.07-1 *Scope.* This specification covers two grades of staybolt steel to be used in boilers and other pressure vessels.

§ 51.07-5 *Process.* The steel shall be made by either or both of the following processes: open-hearth or electric-furnace.

§ 51.07-10 *Chemical composition.* The steel shall conform to the following requirements as to chemical composition:

TABLE 51.07-10—CHEMICAL COMPOSITION

Chemical elements	Grade A	Grade B
	Percent	Percent
Carbon, maximum	0.30 to 0.50	0.27
Manganese	0.30 to 0.50	.40 to .80
Phosphorus, maximum	.04	.04
Sulfur, maximum	.05	.05
Silicon, maximum		.30

§ 51.07-15 *Tensile properties.* The material shall conform to the following requirements as to tensile properties:

TABLE 51.07-15—PHYSICAL PROPERTIES

Physical requirements	Grade A	Grade B
Tensile strength, p. s. i.	45,000 to 55,000	58,000 to 68,000
Yield point, minimum, p. s. i.	0.5 tens. str.	0.5 tens. str.
But in no case less than	1,500,000	32,000
Elongation in 8 inches, minimum, percent	tens. str. but not to exceed 30.	1,500,000 tens. str. but in no case less than 23.

§ 51.07-20 *Bending properties.* (a) *Cold-bend tests.* (1) The test specimen for Grade A steel shall stand being bent cold through 180° flat on itself without cracking on the outside of the bent portion.

(2) The test specimen for grade B steel shall stand being bent cold through 180° without cracking on the outside of the bent portion, as follows: For material 3/4 inch and under in diameter, around a pin the diameter of which is equal to one-half the diameter of the specimen; for material over 3/4 inch in diameter, around a pin the diameter of which is equal to the diameter of the specimen.

(b) *Quench-bend tests.* (1) The test specimen for Grade A steel when heated to a light cherry red as seen in the dark (not less than 1,200° F.), and quenched at once in water the temperature of which is between 80° and 90° F., shall stand being bent through 180° flat on itself without cracking on the outside of the bent portion.

(2) The test specimen for Grade B steel, when similarly heated and quenched, shall stand being bent cold through 180° without cracking on the outside of the bent portion, as follows: For material 3/4 inch and under in diam-

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

eter, around a pin the diameter of which is equal to the diameter of the specimen; for material over $\frac{3}{4}$ inch in diameter, around a pin the diameter of which is equal to one and one-half times the diameter of the specimen.

§ 51.07-25 *Test specimens.* Test specimens shall be the full diameter of the bars as rolled.

§ 51.07-30 *Number of tests.* (a) Two tension, two cold-bend, and two quench-bend tests shall be made from each melt. Each test shall conform to the requirements specified in §§ 51.07-15 and 51.07-20.

(b) If any test specimen develops flaws, it may be discarded and another specimen substituted.

(c) If the percentage of elongation of any tension test specimen is less than that specified in § 51.07-15 and any part of the fracture is outside the middle third of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

§ 51.07-35 *Permissible variations in diameter.* The diameter of hot-finished staybolt bars shall not vary from the size specified by more than the amounts prescribed in table 51.07-35.

TABLE 51.07-35—PERMISSIBLE VARIATIONS IN THE SIZE OF HOT-ROLLED ROUNDS AND SQUARES

Specified size	Variations from size, inches		Out of round or square inches
	Over	Under	
$\frac{3}{16}$ inch and under	0.005	0.005	0.008
Over $\frac{3}{16}$ inch to $\frac{1}{4}$ inch, inclusive	.006	.006	.009
Over $\frac{1}{4}$ inch to $\frac{5}{16}$ inch, inclusive	.007	.007	.010
Over $\frac{5}{16}$ inch to $\frac{3}{8}$ inch, inclusive	.008	.008	.012
Over $\frac{3}{8}$ inch to 1 inch, inclusive	.009	.009	.013
Over 1 inch to $1\frac{1}{4}$ inches, inclusive	.010	.010	.015
Over $1\frac{1}{4}$ inches to $1\frac{3}{4}$ inches, inclusive	.011	.011	.016
Over $1\frac{3}{4}$ inches to 1 $\frac{1}{2}$ inches, inclusive	.012	.012	.018
Over 1 $\frac{1}{2}$ inches to 1 $\frac{3}{4}$ inches, inclusive	.014	.014	.021
Over 1 $\frac{3}{4}$ inches to 2 inches, inclusive	$\frac{3}{64}$	$\frac{3}{64}$	.023

§ 51.07-40 *Finish.* The material shall be free from injurious defects and shall have a workmanlike finish.

§ 51.07-45 *Marking.* The staybolt bars shall, when loaded for shipment, be properly separated and marked with the name or brand of the manufacturer and the melt number for identification. The melt number shall be legibly marked on each test specimen.

SUBPART 51.10—STEEL BARS AND SHAPES

NOTE: In substantial agreement with A. S. M. E. Specification No. SA-7, 1946.¹ Tested material—class A.

§ 51.10-1 *Process.* The steel shall be made by either or both of the following processes: open-hearth or electric-furnace.

¹ A copy of this A. S. M. E. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

§ 51.10-5 *Chemical composition.* The steel shall conform to the following requirements as to chemical composition:

Phosphorus, maximum, percent:	
Acid	0.05
Basic	.04
Sulphur, maximum, percent:	.05

§ 51.10-10 *Tension tests.* The material shall conform to the following requirements as to tensile properties:

Tensile strength, p. s. i.: 55,000 to 65,000.
Yield point, minimum, p. s. i.: 0.5 tensile strength.

Elongation in 8 inches, minimum, percent:

1,500,000

tensile strength

Elongation in 2 inches, minimum, percent: 25.

§ 51.10-15 *Modification in elongation.* For material over $\frac{3}{4}$ inch in thickness, a deduction from the percentages of elongation specified of 0.125 percent shall be made for each increase of $\frac{1}{32}$ inch of the specified thickness above $\frac{3}{4}$ inch.

§ 51.10-20 *Bending properties.* The bend test specimen shall stand being bent cold through 180° without cracking on the outside of the bent portion to an inside diameter which shall have the following relation to the thickness of the specimen:

TABLE 51.10-20—BENDING TEST

Thickness of material	Ratio of inside diameter of bend to thickness of specimen
$\frac{3}{4}$ inch and under	$\frac{1}{4}$
Over $\frac{3}{4}$ to 1 inch, inclusive	1
Over 1 to $1\frac{1}{4}$ inches, inclusive	$1\frac{1}{4}$
Over $1\frac{1}{4}$ to 2 inches, inclusive	$2\frac{1}{2}$
Over 2 inches	3

§ 51.10-25 *Test specimens.* (a) Test specimens shall be of the full thickness or diameter of material as rolled, except as specified in paragraphs (b) and (c).

(b) Test specimens for shapes and flats may be machined to the form and dimensions shown in figure 51.04-35 (d), or with both edges parallel.

(c) Test specimens for bars over $1\frac{1}{2}$ inches in thickness or diameter may be machined to a thickness or diameter of at least $\frac{3}{4}$ inch for a length of at least 9 inches; or tension test specimens may conform to the dimensions shown in figure 51.04-35 (f). Bend test specimens may be 1 by $\frac{1}{2}$ inch in section.

§ 51.10-30 *Number of tests.* (a) One tension and one bend test shall be made from each melt; except that if material from one melt differs $\frac{3}{8}$ inch or more in thickness, one tension and one bend test shall be made from both the thickest and the thinnest material rolled.

(b) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(c) If the percentage of elongation of any tension test specimen is less than that specified in § 51.10-10 and any part of the fracture is more than $\frac{3}{4}$ inch from the center of the gauge length of a 2-inch specimen, or is outside the middle third of the gauge length of an 8-inch speci-

men, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

§ 51.10-35 *Permissible variation in gauge.* The diameter of each bar shall not vary from that specified more than the amount given in the following table:

TABLE 51.10-35—PERMISSIBLE VARIATIONS

Diameter (inches)		Variation in diameter (inches)		
Over	To and including	Under	Over	Out-of-round
	$\frac{5}{16}$	0.007	0.007	0.010
$\frac{5}{16}$	$\frac{7}{16}$	.007	.007	.011
$\frac{7}{16}$	$\frac{9}{16}$	.008	.008	.012
$\frac{9}{16}$	$\frac{1}{2}$	.009	.009	.014
$\frac{1}{2}$	1	.010	.010	.015
1	$1\frac{1}{4}$	.012	.012	.016
$1\frac{1}{4}$	$1\frac{3}{4}$	.014	.014	.018
$1\frac{3}{4}$	2	.016	.016	.022
2	$2\frac{1}{2}$	.018	.018	.025
$2\frac{1}{2}$	3	.022	.022	.030
	$3\frac{1}{2}$	0.0	$\frac{1}{64}$	$\frac{1}{32}$
	$4\frac{1}{2}$	0.0	$\frac{3}{64}$	$\frac{3}{64}$

§ 51.10-40 *Finish.* The finished material shall be free from injurious defects and shall have a workmanlike finish.

§ 51.10-45 *Marking.* Bars shall, when loaded for shipment, be properly separated, and marked with the name or brand of the manufacturer and melt number for identification. The melt number shall be legibly marked on each test specimen.

SUBPART 51.13—WROUGHT-IRON BARS FOR STAYS AND STAY BOLTS

NOTE: In substantial agreement with A. S. T. M. Designation: A 84-39.¹ Tested material—class A.

§ 51.13-1 *Material.* The bars shall be rolled from a slab pile, or box pile made from reworked wrought iron or reworked knobbled charcoal iron. The original muck or knobbled bars shall be twice piled and rerolled. All bars shall be the full length of the piles. The wrought iron and the component parts of the slab pile, or box pile shall be free from any admixture of iron scrap or steel.

§ 51.13-5 *Definitions of terms—(a) Wrought iron.* Wrought iron, within the meaning of this specification, is a ferrous material aggregated from a solidifying mass of pasty particles of highly refined metallic iron, with which, without subsequent fusion, is incorporated a minutely and uniformly distributed quantity of slag.

(b) *Slab pile.* A slab pile is built up wholly of flat bars of iron all running the full length of the pile.

(c) *Box pile.* A box pile is a pile, the sides, top, and bottom of which are formed of flat bars, and the interior of a number of small bars, all bars running the full length of the pile.

(d) *Scrap iron.* The term applies to foreign or bought scrap and does not include local mill products free from foreign or bought scrap.

§ 51.13-10 *Tensile properties.* The materials shall have the following tensile properties:

Tensile strength, p. s. i.: 47,000 to 52,000.
Yield point, minimum: 0.6 tensile strength.

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Elongation in 8 inches, minimum, percent: 30.
Reduction of area, minimum, percent: 48.

§ 51.13-15 *Chemical composition and tests.* (a) The iron shall conform to the following requirement as to chemical composition: Manganese, not over 0.06 percent.

(b) If, in the judgment of the inspector it is necessary, an analysis may be made from a broken test specimen representing each lot of bars to determine whether the chemical composition is in compliance with the above requirement.

(c) Drillings for analysis shall be so taken as to represent the entire cross section of the specimen.

§ 51.13-20 *Modifications in tensile properties.* For bars $\frac{7}{8}$ inch down to and including $\frac{1}{16}$ inch in diameter, the elongation shall be not less than 28 percent. For bars $\frac{5}{8}$ inch and under in diameter, the elongation shall be not less than 25 percent. For bars over $\frac{1}{4}$ square inches in sectional area, the following deductions from the minimum requirements specified in § 51.13-10 shall be made for each square inch of nominal section above $\frac{1}{4}$ square inches:

Tensile strength: 250 p. s. i., but not under 46,000 p. s. i.
Reduction of area: 3 percent, but not under 40 percent.

§ 51.13-25 *Bend tests.* (a) Bend tests may be made by pressure or blows; the test specimen shall stand being bent cold through 180° flat on itself in both directions, without fracture on the outside of the bent portions.

(b) The test specimen, when nicked 25 percent around with a tool having a 60° cutting edge, to a depth of not less than 8 nor more than 16 percent of the diameter of the specimen and broken, shall show a wholly fibrous fracture.

§ 51.13-30 *Etch tests.* (a) The cross section of the test specimen shall be ground or polished, and etched for a sufficient period to develop the structure. This test shall show the material as follows: The material to have been rolled from a slab pile, or box pile and to be uniform and free from steel.

NOTE: A solution of 10 percent hydrochloric acid (sp. gr. 1.19), 30 percent sulfuric acid (sp. gr. 1.84), and 60 percent water; or 25 percent nitric acid (sp. gr. 1.42), and 75 percent water, is recommended for the etch test.

(b) Tension-test specimens and bend-test specimens shall be of the full section of the material as rolled, if possible; otherwise the specimen shall be machined from the material as rolled.

(c) Etch-test specimens shall be of the full section of material as rolled.

§ 51.13-35 *Number of tests.* (a) All bars of a given grade and size shall be piled separately, sorted in lots of 100 each. Two bars shall be selected at random from each lot or fraction thereof and tested as specified, but only one of these bars shall be tested as specified in § 51.13-30.

(b) If any test specimen from the bars originally selected to represent a lot of material contains surface defects not visible before testing but visible after testing, or if a tension-test specimen

breaks outside the middle third of the gauge length, the individual bar shall be rejected and one retest from a different bar will be allowed.

§ 51.13-40 *Finish.* The bars shall be smoothly rolled and free from slivers, depressions, crop ends, seams, and evidences of being burnt.

§ 51.13-45 *Marking.* The bars shall be stamped or otherwise marked as designated by the inspector.

SUBPART 51.16—RIVET STEEL

NOTE: In substantial agreement with A. S. T. M. Designations: Nos. A 31-40 and A 202-46. Tested material—class A.

§ 51.16-1 *Scope.* This specification covers two grades of low carbon steel rivets and one grade of chrome-manganese-silicon alloy-steel rivets to be used in boilers and other pressure vessels. These grades are designated A, B, and C, respectively.

TABLE 51.16-15—PHYSICAL PROPERTIES

Physical requirements	Grade A	Grade B	Grade C
Tensile strength, p. s. i.	45,000 to 55,000	58,000 to 68,000	75,000 to 90,000
Yield point, minimum, p. s. i.	0.5 tens. str.	0.5 tens. str.	0.60 tens. str.
But in no case less than	1,500,000	1,500,000	1,600,000
Elongation in 8 inches, minimum, percent.	tens. str. but need not exceed 30.	tens. str. but in no case less than 23.	tens. str.

¹ For grade C material over $\frac{3}{4}$ inch in thickness, a deduction from the percentage of elongation specified above of 0.125 percent shall be made for each increase of $\frac{1}{32}$ inch of the specified thickness above $\frac{3}{4}$ inch to a minimum of 10 percent.

For grade C material $\frac{1}{4}$ inch and under in thickness, the elongation shall be measured on a gauge length of 24 times the thickness of the specimen.

§ 51.16-20 *Bending properties—(a) Cold-bend tests.* (1) The test specimen for grade A steel shall stand being bent cold through 180° flat on itself without cracking on the outside of the bent portion.

(2) The test specimen for grade B steel shall stand being bent cold through 180° without cracking on the outside of the bent portion, as follows: For material $\frac{3}{4}$ inch and under in diameter, around a pin the diameter of which is equal to one-half the diameter of the specimen; for material over $\frac{3}{4}$ inch in diameter, around a pin the diameter of which is equal to the diameter of the specimen.

(3) The test specimen for grade C steel shall stand being bent cold through 180° without cracking on the outside of the bent portion around a pin the diameter of which shall have the following relation to the thickness of the specimen:

Ratio of pin diameter to thickness of specimen

Thickness of material:	
1 inch and under	2
Over 1 to $1\frac{1}{2}$ inches, inclusive	2 $\frac{1}{2}$
Over $1\frac{1}{2}$ to 2 inches, inclusive	3

(b) *Quench-bend tests.* (1) The test specimen for grade A steel when heated to a light cherry red as seen in the dark (not less than 1,200° F.), and quenched at once in water the temperature of

§ 51.16-5 *Process.* The steel shall be made by either or both of the following processes: Open-hearth or electric-furnace.

§ 51.16-10 *Chemical composition.* The steel shall conform to the following requirements as to chemical composition:

TABLE 51.16-10—CHEMICAL COMPOSITION

Chemical elements	Grade A	Grade B	Grade C
Carbon, maximum	Percent 0.27	Percent 0.27	Percent 0.17
Manganese	0.30 to 0.50	0.40 to .80	1.05 to 1.40
Phosphorus, maximum	.04	.04	.035
Sulfur, maximum	.05	.05	.04
Silicon, maximum		.30	.60 to .90
Chromium			.30 to .60

§ 51.16-15 *Tensile properties.* The material shall conform to the following requirements as to tensile properties:

which is between 80° and 90° F., shall stand being bent through 180° flat on itself without cracking on the outside of the bent portion.

(2) The test specimen for grade B steel, when similarly heated and quenched, shall stand being bent cold through 180° without cracking on the outside of the bent portion as follows: For material $\frac{3}{4}$ inch and under in diameter, around a pin the diameter of which is equal to the diameter of the specimen; for material over $\frac{3}{4}$ inch in diameter, around a pin the diameter of which is equal to one and one-half times the diameter of the specimen.

§ 51.16-25 *Test specimens.* (a) Test specimens shall be the full diameter of the bar as rolled and, in the case of rivet bars which have been cold-drawn, shall be normalized before testing.

(b) Two tension, two cold-bend, and two quench-bend tests where called for, shall be made from each melt. Each test shall conform to the requirements specified in §§ 51.16-15 and 51.16-20.

(c) If any test specimen develops flaws, it may be discarded and another specimen substituted.

(d) If the percentage of elongation of any tension test specimen is less than that specified in § 51.16-15 and any part of the fracture is outside the middle third of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

§ 51.16-30 *Tests of finished rivets—(a) Bending properties.* (1) The rivet shank of grade A steel shall stand being bent cold through 180° flat on itself as

¹ Copies of these A. S. T. M. specifications have been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

shown in figure 51.16-30 (a) without cracking on the outside of the bent portion.

(2) The rivet shank of grade B steel shall stand being bent cold through 180° without cracking on the outside of the bent portion, as follows: For material $\frac{3}{4}$ inch and under in diameter, around a pin the diameter of which is equal to the diameter of the shank; for material over $\frac{3}{4}$ inch in diameter, around a pin the diameter of which is equal to one and one-half times the diameter of the shank.

(3) The rivet shank of grade C steel shall stand being bent cold through 180° without cracking on the outside of the bent portion, as follows: For material 1 inch and under in diameter, around a pin the diameter of which is equal to two and one-half times the diameter of the shank; for material over 1 inch in diameter, around a pin the diameter of which is equal to three times the diameter of the shank.

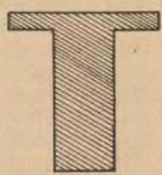
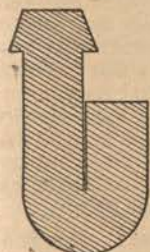


FIGURE 51.16-30 (a)—Bending test for rivets.

FIGURE 51.16-30 (b)—Flattening test for rivets.

(b) *Flattening tests.* The rivet head shall stand being flattened, while hot, to a diameter two and one-half times the diameter of the shank, as shown in figure 51.16-30 (b), without cracking at the edges.

(c) *Number of tests.* Three bend and three flattening tests shall be made from each size in each lot of rivets offered for inspection. Each test shall conform to the requirements specified in paragraphs (a) and (b).

§ 51.16-35 *Permissible variations in diameter.*—(a) *Finished rivets.* (1) The diameter of finished rivets, measured cold, shall not vary from the size specified by more than the amounts prescribed in the following table:

TABLE 51.16-35 (a)—PERMISSIBLE VARIATIONS

Diameter specified	Permissible variations in diameter, in inches	
	Snap gauge measurement	Ring gauge measurement
$\frac{1}{8}$ inch and under	Under 0.022	Over 0.020
Over $\frac{1}{8}$ inch to 1 inch, inclusive	.025	.030
Over 1 inch to $1\frac{1}{4}$ inches, inclusive	.027	.035
Over $1\frac{1}{4}$ inches to $1\frac{1}{2}$ inches, inclusive	.030	.040
Over $1\frac{1}{2}$ inches to 2 inches, inclusive	.037	.040

(2) Snap gauge measurement shall be made at the point of minimum diameter, but it is not required that the rivet shall turn completely in the gauge. Measurements of the maximum tolerance shall be made with a ring gauge, all rivets to slip

full to the head in the gauge of the required size for the various diameters.

(b) *Rivet heads.* The dimensions of the rivet heads shall not vary from the size specified by more than the amounts prescribed in the following table:

TABLE 51.16-35 (b)—PERMISSIBLE VARIATIONS IN RIVET HEADS

Specified size of rivets (inches)	Permissible variations in diameter of head	
	Width	Height (inches)
$\frac{1}{8}$ inch	Plus $\frac{1}{16}$ inch	Minus $\frac{1}{32}$ inch
$\frac{1}{4}$ inch	Plus $\frac{1}{16}$ inch	Minus $\frac{1}{32}$ inch
$\frac{3}{8}$ inch	Plus $\frac{1}{16}$ inch	Minus $\frac{1}{32}$ inch
$\frac{1}{2}$ inch	Plus $\frac{1}{16}$ inch	Minus $\frac{1}{32}$ inch
$\frac{5}{8}$ inch	Plus $\frac{1}{16}$ inch	Minus $\frac{1}{32}$ inch
$\frac{3}{4}$ inch	Plus $\frac{1}{16}$ inch	Minus $\frac{1}{32}$ inch
$\frac{7}{8}$ inch	Plus $\frac{1}{16}$ inch	Minus $\frac{1}{32}$ inch
1 inch	Plus $\frac{1}{16}$ inch	Minus $\frac{1}{32}$ inch

§ 51.16-40 *Workmanship and finish.* The finished rivets shall be true to form and concentric, shall be made in a workmanlike manner, and shall be free from injurious defects.

SUBPART 51.19—RIVET IRON

NOTE: In substantial agreement with A. S. T. M. Designation: No. A 152-39.¹ Tested material—Class A.

§ 51.19-1 *Material.* The rivet bars shall be made of wrought iron which shall be free from any admixture of iron scrap or steel.

NOTE: Wrought iron is a ferrous material, aggregated from a solidifying mass of pasty particles of highly refined metallic iron, with which without subsequent fusion, is incorporated a minutely and uniformly distributed quantity of slag.

§ 51.19-5 *Chemical composition.* The iron shall conform to the following requirement as to chemical composition: Manganese, not over 0.06 percent.

§ 51.19-10 *Tensile properties.* The material shall conform to the following requirements as to tensile properties:

Tensile strength, minimum, p. s. l.	47,000
Yield point, minimum, p. s. l.	0.6 tens. str.
Elongation in 8 inches, minimum, percent:	
Rounds $\frac{1}{4}$ to $\frac{7}{8}$ inch, inclusive, in diameter	22
Rounds over $\frac{7}{8}$ to $\frac{3}{4}$ inch, inclusive, in diameter	24
Rounds over $\frac{3}{4}$ to 2 inches, inclusive, in diameter	28

§ 51.19-15 *Bend tests.*—(a) *Quenched cold-bend tests.* A test specimen shall be heated between 1,600° and 1,700° F., and quenched in cold water, after which it shall stand being bent cold through 90° around a pin, the diameter of which is equal to the diameter of the specimen without fracture on the outside of the bent portion.

(b) *Nick-bend tests.* A test specimen, when nicked 25 percent around the circumference with a tool having a 60° cutting edge, to a depth of not less than 8 nor more than 16 percent of the diameter or thickness of the specimen, and broken slowly, shall show a wholly fibrous fracture.

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

(c) *Hot-bend tests.* A test specimen, when heated to a temperature between 1,700° and 1,800° F., shall stand being bent through 180° flat on itself without fracture on the outside of the bent portion.

(d) *Methods.* Bend tests may be made by pressure or blows.

§ 51.19-20 *Test specimens.* All test specimens shall be of the full section of the material as rolled.

§ 51.19-25 *Number of tests.* (a) All bars of a given size shall be piled separately, sorted in lots of 100 each. Two bars shall be selected at random from each lot or fraction thereof and tested as specified in §§ 51.19-10 to 51.19-20.

(b) If any of the specimens originally selected to represent a lot of material contains surface defects not visible before testing, but visible after testing, or if a tension-test specimen breaks outside the middle third of the gauge length, as indicated by scribe scratches marked on the specimen before testing, the individual specimen shall be rejected and one retest from a different bar shall be allowed.

§ 51.19-30 *Micrographic tests.* If doubt exists as to the presence of steel, the inspector may make micrographic examination to assist in determining whether the material conforms to the requirements of § 51.19-1.

§ 51.19-35 *Physical properties and tests.*—(a) *Flattening tests.* The rivet head shall stand being flattened, while hot, to a diameter two times the diameter of the shank, as shown in figure 51.16-30 (b), without cracking at the edges.

(b) *Etch test.* The rivet shall be split longitudinally through head and shank. After grinding or polishing and etching in acid, the section shall show freedom of folds at base of head, and the fiber lines shall show symmetrical displacement.

NOTE: A solution of 10 percent hydrochloric acid (sp. gr. 1.19), 30 percent sulfuric acid (sp. gr. 1.84), and 60 percent water; or 25 percent nitric acid (sp. gr. 1.42) and 75 percent water, is recommended for the etch test.

(c) *Number of tests.* Three flattening and three etch tests shall be made from each lot of 2,000 pounds or less of any one diameter of rivets offered for inspection. Each test shall conform to the requirements specified in paragraphs (a) and (b).

§ 51.19-40 *Workmanship and finish.* The rivets shall be true to form and concentric, shall be made in a workmanlike manner, and shall be free from injurious defects. The heads shall not show cracks or splits on the edge but may contain a slight flash.

§ 51.19-45 *Inspection.* All inspections shall be made at the place of manufacture prior to shipment, unless otherwise specified, and the inspector shall have the right to reject all rivets found to be not in compliance with the requirements of this subpart.

§ 51.19-50 *Rejection.* Rivets which show defects subsequent to their acceptance at the place of manufacture will be rejected and the manufacturer shall be notified.

**SUBPART 51.22—FLANGE AND FIREBOX
STEEL PLATE**

NOTE: In substantial agreement with A. S. T. M. Designation: A 285-46.¹ Certified material—class B.

§ 51.22-1 *Scope.* (a) This specification covers three grades of carbon-steel plate of flange and firebox qualities of low and intermediate tensile strengths.

(b) The maximum thickness of plates to be ordered under this specification shall be 2 inches.

(c) This material is intended for arc or gas welding, excepting that firebox quality in grade A or B is intended for forge welding when the requirements

specified in § 51.22-10 (b) are applied. The purchaser shall specify when the material is to be used for forge welding.

NOTE: The term "forge welding" as used in this specification refers to the process of heating with gas, and hammering mechanically, with or without the use of fluxes.

§ 51.22-5 *Process.* The steel shall be made by either or both of the following processes: open-hearth or electric-furnace.

§ 51.22-10 *Chemical composition.* (a) The steel shall conform to the following requirements as to chemical composition:

TABLE 51.22-10 (a)—CHEMICAL COMPOSITION

Chemical elements	Flange			Firebox ¹		
	Grade A	Grade B	Grade C	Grade A	Grade B	Grade C
Carbon, maximum:						
For plates $\frac{3}{4}$ inch and under in thickness	Percent	Percent	Percent	Percent	Percent	Percent
For plates over $\frac{3}{4}$ inch to 2 inches, inclusive, in thickness	0.15	0.20	0.25	0.15	0.20	0.25
Manganese, maximum	0.80	0.80	0.80	0.17	0.22	0.30
Phosphorus, maximum:						
Acid	0.06	0.06	0.06	0.04	0.04	0.04
Basic	0.04	0.04	0.04	0.035	0.035	0.035
Sulfur, maximum	0.05	0.05	0.05	0.04	0.04	0.04

¹ See § 51.22-10 (b).

(b) When the firebox quality in Grade A or B is intended for material that is to be forge welded, the nickel, chromium, and silicon contents shall not exceed 0.08 percent each, and the copper content shall not exceed 0.15 percent.

§ 51.22-15 *Tensile properties.* (a) The material shall conform to the following requirements as to tensile properties:

TABLE 51.22-15 (a)—PHYSICAL PROPERTIES

Physical requirements	Flange		
	Grade A	Grade B	Grade C
Tensile strength, p. s. i.	45,000 to 55,000	50,000 to 60,000	55,000 to 65,000
Yield point, minimum, p. s. i.	0.5 tens. str.	0.5 tens. str.	0.5 tens. str.
But in no case less than	24,000	27,000	30,000
Elongation in 8 inches, minimum, percent	1,500,000 tens. str.	1,500,000 tens. str.	1,500,000 tens. str.

Physical requirements	Firebox		
	Grade A	Grade B	Grade C
Tensile strength, p. s. i.	45,000 to 55,000	50,000 to 60,000	55,000 to 65,000
Yield point, minimum, p. s. i.	0.5 tens. str.	0.5 tens. str.	0.5 tens. str.
But in no case less than	24,000	27,000	30,000
Elongation in 8 inches, minimum, percent	1,500,000 tens. str.	1,500,000 tens. str.	1,500,000 tens. str.

¹ See § 51.22-15 (b).

² See § 51.22-15 (d), (e) and (f).

(b) On the tension-test specimen taken from the top of the firebox plates, tensile strength only is to be determined.

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

and it shall not exceed 60,000 p. s. i. for Grade A, 65,000 p. s. i. for grade B, nor 70,000 p. s. i. for Grade C.

(c) The yield point shall be determined by the drop of the beam or halt in the gauge of the testing machine.

(d) For material over $\frac{3}{4}$ to 2 inches, inclusive, in thickness, a deduction from the percentage of elongation in 8 inches specified in paragraph (a) of 0.125 percent shall be made for each increase of $\frac{1}{32}$ inch of the specified thickness above $\frac{3}{4}$ inch to a minimum of 22 percent for flange steel and 23 percent for firebox steel, grade A or B; and 21 percent for flange steel and 22 percent for firebox steel, grade C.

(e) For material $\frac{1}{4}$ inch and under in thickness the elongation shall be measured on a gauge length of 24 times the nominal thickness of the specimen, and the elongation shall conform to the minimum requirement specified for the 8-inch gauge length.

(f) The elongation in 8 inches need not exceed 30 percent.

§ 51.22-20 *Bending properties.* (a) The bend-test specimens shall stand being bent cold through 180° without cracking on the outside of the bent portion to a diameter which shall have the following relation to the thickness of the specimen.

TABLE 51.22-20—BENDING PROPERTIES

Thickness of material	Ratio of inside diameter of bend to thickness of specimen	
	Sheared and gas cut plates	Universal mill plates
1 inch and under	1	1 $\frac{1}{2}$
Over 1 to 1 $\frac{1}{4}$ inches, inclusive	1 $\frac{1}{2}$	2 $\frac{1}{2}$
Over 1 $\frac{1}{4}$ to 2 inches, inclusive	2	3

(b) The requirements for universal edge rolled plates apply only when such

plates are permitted for double-butt-strap construction.

§ 51.22-25 *Homogeneity test.* (a) The object of the homogeneity test, which is required for firebox steel only, is to open and render visible to the eye any seams due to failure to weld up or to interposed foreign matter, or any cavities due to gas bubbles in the ingot. The fractured surface of the test specimen shall not show any single seam or cavity more than $\frac{1}{4}$ inch in length for plates $\frac{3}{4}$ inch and under in thickness nor more than $\frac{3}{8}$ inch in length for plates over $\frac{3}{4}$ to 2 inches, inclusive, in thickness, in any of the fractures obtained in accordance with paragraph (b). Each fracture shall be examined and the lengths of the seams and cavities determined, a pocket lens being used if necessary.

(b) The test may be made on a broken tension-test specimen. For plates $\frac{3}{4}$ inch and under in thickness the specimen shall be nicked or grooved transversely, in three places, about $\frac{1}{16}$ inch deep. The first groove shall be 2 inches from the square end, and each succeeding groove on the opposite side about 2 inches from the preceding one. For plates over $\frac{3}{4}$ to 2 inches, inclusive, in thickness the specimen may be grooved about $\frac{1}{8}$ inch deep, at one place on one side. The specimen shall be broken at each groove with a hammer or press.

§ 51.22-30 *Test specimens.* (a) Test specimens shall be prepared for testing from material in its rolled condition.

(b) Tension-test specimens for firebox steel shall be taken from the top and bottom corners of the plate as rolled, parallel to its longitudinal axis, and for flange steel from the bottom corner of the plate only. Bend-test specimens shall be taken from the middle of the top of the plate as rolled, at right angles to its longitudinal axis.

(c) Tension- and bend-test specimens shall be the full thickness of the material as rolled and shall be machined to the form and dimensions shown in figure 51.04-35 (d); or the bend-test specimen may be machined with both edges parallel.

(d) The sides of the bend-test specimens may have the corners rounded to a radius not over $\frac{1}{16}$ inch.

§ 51.22-35 *Number of tests.* (a) Two tension tests and one bend test shall be made from each firebox steel plate as rolled. One tension test and one bend test shall be made from each flange steel plate as rolled.

(b) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(c) If the percentage of elongation of any tension-test specimen is less than that specified in § 51.22-15 (a) and any part of the fracture is outside the middle third of the gauge length as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

§ 51.22-40 *Permissible variation in thickness.* No plate shall vary more than 0.01 inch under the thickness specified.

§ 51.22-45 *Finish.* The material shall be free from injurious defects and shall have a workmanlike finish.

§ 51.22-50 *Marking.* (a) Except as specified in paragraph (b), the name or brand of the manufacturer, the manufacturer's test identification number, class and lowest tensile strength specified in § 51.22-15 (a) shall be legibly stamped on each finished plate, in two places not less than 12 inches from the edges and on each butt-strap near the center line not less than 12 inches from each end. Plates the maximum lengthwise and crosswise dimensions of which do not exceed 48 inches, shall have the marking stamped in one place approximately midway between the center and the edge. The manufacturer's test identification number shall be legibly stamped on each test specimen.

(b) For plates under $\frac{1}{4}$ inch in thickness, the marking specified in paragraph (a) shall be legibly stenciled instead of stamped.

SUBPART 51.25—LAP-WELDED AND SEAMLESS STEEL AND LAP-WELDED IRON BOILER TUBES

NOTE: In substantial agreement with A. S. T. M. Designation: A 83-46¹. Certified material—class B.

§ 51.25-1 *Scope.* This specification covers lap-welded and seamless steel, and lap-welded iron boiler tubes and boiler flues, including safe ends, stay tubes, and seamless superheater and small boiler tubes.

§ 51.25-5 *Process.* (a) The material for lap-welded or seamless steel tubes shall be made by either or both of the following processes: open-hearth or electric furnace. The material for open-hearth iron tubes shall be made by the open-hearth process.

(b) The material for wrought-iron tubes shall be made by the knobbled, hammered charcoal-iron process.

§ 51.25-10 *Chemical composition.* (a) Chemical analysis will not be required for charcoal-iron tubes.

(b) Material made by the open-hearth or electric-furnace processes shall conform to the following requirements as to chemical composition:

TABLE 51.25-10 (b)—CHEMICAL COMPOSITION¹

Chemical elements	Grade A low-carbon steel ²	Grade B open-hearth iron	Alternate Grade B open-hearth iron
	Percent	Percent	Percent
Carbon.....	0.08 to 0.18	0.03	0.05
Manganese.....	.30 to .60	.03	.35
Phosphorus, maximum.....	.04	.02	.02
Sulfur, maximum.....	.045	.045	.045
Molybdenum.....			.05 to .15
Copper, minimum.....			.40

¹ Alternate grade B may be specified conforming to the chemical requirements given above. This alternate grade B shall meet all the tests and other requirements now specified for grade B.

² When grade A tubes are specified with copper content, the copper range shall be 0.20 to 0.35 percent.

³ Maximum.

⁴ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

§ 51.25-15 *Check analysis.* (a) An analysis of two tubes from each lot of 250 tubes or fraction thereof, and from each lot of 2,000 feet or fraction thereof, of safe-end material may be made by the inspector. Drillings for analysis shall be taken from several points around each tube selected for analysis. The chemical composition thus determined shall conform to the requirements specified in § 51.25-10 (b).

(b) If the analysis of either tube does not conform to the requirements specified, an analysis of two additional tubes from the same lot shall be made, each of which shall conform to the requirements specified in § 51.25-10 (b).

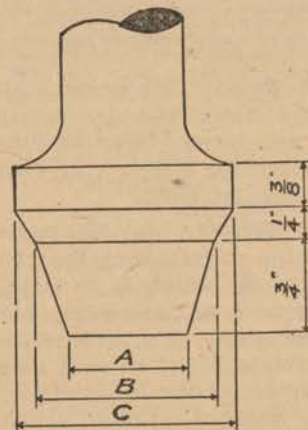
§ 51.25-20 *Flange tests.* (a) For tubes having wall thicknesses¹ less than 10 percent of their outside diameters, and providing the thickness does not exceed 0.200 inch, a section not less than 4 inches in length shall be capable of having a flange turned over at a right angle to the body of the tube without cracking or showing flaws. This flange as measured from the outside of the tube shall be not less than $\frac{1}{8}$ inch nor more than $\frac{1}{2}$ inch. Within these limits, the width of the flange shall be not less than the following:

TABLE 51.25-20 (a)—FLANGE TEST

Outside diameter of tube (inches)	Width of flange	
	Open-hearth or electric-furnace grade A or B tubes	Charcoal-iron tubes
2½ and under....	15 percent of outside diameter.	12.5 percent of outside diameter.
Over 2½ to 3¾....	¾ inch.	¾ inch.
Over 3¾ to 6.....	10 percent of outside diameter.	10 percent of outside diameter.

(b) For tubes other than those specified in paragraph (a), the flange test shall not be required.

(c) In making the flange test, it is recommended that the flaring tool and die block shown in figure 51.25-20 (c) be used.



FLARING TOOL

A = Outside diameter of tube less $\frac{1}{8}$ inch.
B = Outside diameter of tube less $\frac{3}{8}$ inch.
C = Outside diameter of tube plus $\frac{1}{16}$ inch.

§ 51.25-25 *Flattening tests.* (a) For lap-welded tubes having wall thicknesses¹ not exceeding 10 percent of their outside diameters, and providing the thickness does not exceed 0.200 inch, a section not less than 2½ inches in length shall stand being flattened between parallel plates, without cracking or showing flaws, until the distance between the plates is five times the wall thickness. For other lap-welded tubes the distance between the plates shall be six times the wall thickness.

(b) (1) A section of a seamless tube, not less than 2½ inches in length, shall be flattened cold between parallel plates until the opposite walls of the tube meet. No cracks or breaks in the metal shall occur until the distance between the plates is less than the calculated value of H by the following formula:

$$H = \frac{(1+e)t}{e+t/D} \quad (1)$$

where:

H = distance between flattening plates in inches.

e = deformation per unit length (constant for a given grade of steel, 0.09 for the low-carbon grade),

t = nominal wall thickness of tube in inches, and

D = actual outside diameter of tube in inches.

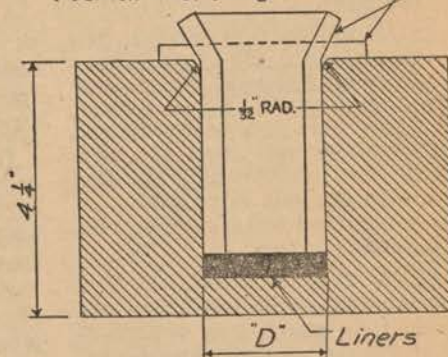
(2) Evidence of laminations or burnt material shall not develop during the entire flattening process.

(c) Superficial ruptures as a result of minor surface imperfections shall not be cause for rejection.

NOTE: In the case of lap-welded charcoal-iron tubes over 0.200 inch in thickness the test shall be made with the weld 45° away from the point of maximum bend. For other lap-welded charcoal-iron tubes and for all steel lap-welded tubes covered by paragraphs (a) and (b), the weld shall be placed in the line of maximum bend.

§ 51.25-30 *Crush test.* (a) When required by the inspector, crushing tests shall be made on sections of tube 2½ inches in length which shall stand crushing longitudinally, without cracking.

Position after applying Flaring Tool
Position after using Flattener



DIE BLOCK

D = Outside diameter of tube plus $\frac{1}{32}$ inch.

FIGURE 51.25-20 (c)—Flaring tool and die block for flange test.

¹ The term "wall thickness" shall be defined as the actual mean wall of the material used.

splitting, or opening at the weld, as follows:

TABLE 51.25-30 (a)—CRUSH TEST

Wall thickness of tubes, inches	Height of crushed section, inches	
	Grades A and B tubes	Charcoal-iron tubes
0.135 and under...	¾, or until outside folds are in contact.	1¼
Over 0.135.....	1¼	1¼

(b) Slight surface checks shall not be cause for rejection.

§ 51.25-35 *Hydrostatic test.* (a) Prior to upsetting, swaging, expanding, bending, or other forming operations, each tube shall be tested at the mill to the hydrostatic pressures as follows: Tubes under 5 inches in diameter shall withstand an internal hydrostatic pressure of 1,000 p. s. i. and tubes 5 inches and over in diameter shall withstand an internal hydrostatic pressure of 800 p. s. i. provided the fiber stress corresponding to these pressures does not exceed 16,000 p. s. i. as determined by formula (1) below. Should the fiber stress corresponding to these pressures exceed the above figures, the hydrostatic test pressure shall be determined by the following formula:

$$P = \frac{2St}{D} \quad (1)$$

where:

P = hydrostatic test pressure in pounds per square inch,

S = allowable fiber stress of 16,000 p. s. i.,

t = thickness of the tube wall in inches, and

D = outside diameter of the tube in inches.

NOTE: When requested by the purchaser and so stated in the order, tubes shall be tested to one and one-half times the specified working pressure (when one and one-half times the specified working pressure exceeds the test pressures specified in paragraph (a)). Provided, The fiber stress corresponding to those test pressures does not exceed 16,000 p. s. i. as determined by the above formula.

(b) Lap-welded tubes shall be struck near both ends, while under the test pressure, with a 2-pound steel hand hammer or its equivalent.

§ 51.25-40 *Etch test for charcoal-iron tubes.* To determine that a tube is charcoal-iron, a cross section of the tube may be turned or ground to a true surface, polished free from dirt or cracks, and etched¹ until the soft parts are sufficiently dissolved to show a decided ridged surface, with the weld very distinct. A steel tube so etched would show an even or homogeneous surface.

§ 51.25-45 *Test specimens.* (a) Test specimens required for the flange and flattening tests specified in §§ 51.25-20 and 51.25-25 shall be taken from the ends

¹ A solution of 10 percent hydrochloric acid (sp. gr. 1.19), 30 percent sulphuric acid (sp. gr. 1.84), and 60 percent water; or 25 percent nitric acid (sp. gr. 1.42) and 75 percent water, is recommended for the etch test.

of finished tubes prior to upsetting, swaging, expanding, or other forming operations, or being cut to length. They shall be smooth on the ends and free from burrs and flaws.

(b) All specimens shall be tested at room temperature.

§ 51.25-50 *Number of tests.* (a) One of each of the tests specified in §§ 51.25-20, 51.25-25, and 51.25-30 shall be made on each of two tubes from each lot of 250 tubes or fraction thereof, and from each 2,000 feet or fraction thereof, of safe-end material.

(b) Each tube shall be subjected to the hydrostatic test specified in § 51.25-35.

§ 51.25-55 *Retests.* If the results of the physical tests of either of the tubes selected for test do not conform to the

requirements specified in §§ 51.25-20, 51.25-25, and 51.25-30, retests shall be made on two additional tubes from the same lot, each of which shall conform to the requirements specified.

§ 51.25-60 *Forming operations.* Tubes when inserted in the boiler shall stand expanding and beading without showing cracks or flaws, or opening at the weld. Superheater tubes when properly manipulated shall stand all forging, welding, and bending operations necessary for application without developing defects.

§ 51.25-65 *Permissible variations in dimensions and weight.* Variations in outside diameter, wall thickness, weight and length, from those specified, shall not exceed the amounts prescribed in the following table:

TABLE 51.25-65—PERMISSIBLE VARIATIONS IN DIMENSIONS AND WEIGHTS

HOT-FINISHED TUBES														
Size outside diameter, inches	Outside diameter (including out of roundness), inches ^{1 2}		Wall thickness, percent ^{1 3}								Weight ⁴ per foot, percent		Cut length, inches ⁴	
			0.095 inch and under		Over 0.095 to 0.150 inch, inclu- sive		Over 0.150 to 0.180 inch, inclu- sive		Over 0.180 inch					
	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under
4 and under.....	¾	¾	40	0	35	0	33	0	28	0	16	0	¾	0
Over 4.....	¾	¾			35	0	33	0	28	0	16	0	¾	0
COLD-DRAWN TUBES														
			Over		Under									
			Over	Under	Over	Under								
Under 1.....	0.004	0.004		20		0		12	0	¾	0			0
1 to 1½, inclusive.....	0.006	0.006		20		0		12	0	¾	0			0
Over 1½ to 2, exclusive.....	0.008	0.008		22		0		13	0	¾	0			0
2 to 2½, exclusive.....	0.010	0.010		22		0		13	0	¾	0			0
2½ to 3, exclusive.....	0.012	0.012		22		0		13	0	¾	0			0
3 to 4, inclusive.....	0.015	0.015		22		0		13	0	¾	0			0
Over 4.....	0.015	0.025		22		0		13	0	¾	0			0

¹ These permissible variations in outside diameter and wall thickness apply only to the tubes as rolled or drawn and before swaging, expanding, bending, polishing, or other fabrication operations.

² Cold-drawn tubing, having a specified wall thickness which is 3 percent, or less than 3 percent, of the outside diameter cannot be straightened properly without a certain amount of ovality resulting in the diameter, consequently such tubes, while having an average outside diameter within the permissible variations prescribed in the table, will require an additional ovality permissible variation of plus or minus 0.5 percent of the outside diameter.

³ On tubes 2 inches and over in outside diameter and 0.220 inch and over in thickness the variation in wall thickness in any one cross section of any one tube shall not exceed plus or minus 10 percent of the actual average wall of that section. The actual average wall as defined as the average of the thickest and thinnest wall in that section.

⁴ The permissible variations in weight apply to lots of 50 tubes or more in sizes 4 inches and under in outside diameter, and to lots of 20 tubes or more in sizes over 4 inches in outside diameter.

⁵ Permissible variations in length apply to tubes before bending.

§ 51.25-70 *Finish.* Finish tubes shall be reasonably straight and have smooth ends, free from burrs. They shall be free from injurious defects and shall have a workmanlike finish.

§ 51.25-75 *Marking.* (a) The name or brand of the manufacturer, the type of material from which it is made, whether seamless or lap-welded, and whether steel or iron, A. S. T. M. A 83, shall be legibly stenciled on each tube 1¼ inches in outside diameter and over, provided the length is not under 3 feet.

(b) On tubes less than 1¼ inches in diameter and on all tubes under 3 feet in length, the information specified in paragraph (a) shall be marked on a tag securely attached to the bundle or box in which the tubes are shipped.

SUBPART 51.28—ELECTRIC-RESISTANCE-WELDED STEEL AND OPEN-HEARTH IRON BOILER AND SUPERHEATER TUBES

NOTE: In substantial agreement with A. S. T. M. Designations: A 178-46 and A 226-47¹. Certified material—class B.

§ 51.28-1 *Scope.* (a) This specification covers three grades of electric-resistance-welded tubes made of steel and open-hearth iron and intended for boiler tubes, boiler flues, superheater tubes, and safe ends², and one grade of electric-resistance-welded steel boiler and superheater tubes ½ inch and

¹ Copies of these A. S. T. M. specifications have been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

² Grade C tubes are not suitable for safe-ending by forge welding.

larger in outside diameter intended for high pressure service. These grades shall be designated grade A, a low-carbon steel tube; grade B, an open-hearth iron tube; grade C, a medium carbon-steel tube; and grade D, a killed steel tube.

(b) Grade D tubes less than 2 inches in outside diameter shall have wall thicknesses of not less than 8 percent of the outside diameter and in no case less than 0.085 inch. Grade D tubes 2 inches and over in outside diameter shall have wall thicknesses of not less than 0.200 inch.

TABLE 51.28-15—CHEMICAL COMPOSITION

Chemical elements	Grade A low-carbon steel	Grade B open-hearth iron	Grade C medium-car- bon steel	Grade D killed steel
	Percent	Percent	Percent	Percent
Carbon	0.08 to 0.18	0.03	0.35	0.08 to 0.18
Manganese	.30 to .60	1.03	1.80	.30 to .60
Phosphorus, maximum	.04	.02	.04	.04
Sulfur, maximum	.045	.045	.045	.045
Silicon, maximum				.25

¹ Maximum.

§ 51.28-20 *Check analysis*—(a) *Grade A, B, or C.* An analysis of 2 tubes from each lot of 250 tubes or fraction thereof, and from each lot of 2,000 feet or fraction thereof of safe-end material, may be made by the inspector. Drillings for analysis shall be taken from several points around each tube selected for analysis. The chemical composition thus determined shall conform to the requirements prescribed in § 51.28-15.

(b) *Grade D.* An analysis of 2 tubes from each lot of 100 tubes or fraction thereof may be made by the inspector. Drillings for analysis shall be taken from several points around each tube selected for analysis. The chemical composition thus determined shall conform to the requirements prescribed in § 51.28-15.

(c) *All grades.* If the analysis of either tube does not conform to the requirements specified, an analysis of two additional tubes from the same lot shall be made, each of which shall conform to the requirements specified in § 51.28-15.

§ 51.28-25 *Flattening test.* (a) (1) For grade A or B tubes having wall thicknesses not exceeding 10 percent of their outside diameters, and providing the thickness does not exceed 0.200 inch, a section not less than 2½ inches in length shall stand being flattened between parallel plates until the distance between the plates is three times the wall thickness without cracking or showing flaws.

(2) For grade A or B tubes other than specified in paragraph (a) (1), a section not less than 2½ inches in length shall stand being flattened between parallel plates, without cracking or showing flaws, until the distance between the plates is four times the wall thickness.

(b) For grade C tubes, a section not less than 2½ inches in length shall stand being flattened between parallel plates until opposite walls of the tube meet. No opening in the weld shall take place until the distance between the plates is less than two-thirds of the original outside diameter of the tube. No cracks or breaks in the metal elsewhere than in the weld shall occur until the distance between the plates is less than one-third

§ 51.28-5 *Process.* The material shall be made by either or both of the following processes: open-hearth or electric-furnace. Grade D shall be a killed steel.

§ 51.28-10 *Manufacture.* Tubes shall be made by electric-resistance-welding and shall be normalized at a temperature above the upper critical temperature.

§ 51.28-15 *Chemical composition.* The material shall conform to the following requirements as to chemical composition:

of the original diameter of the tube. Evidence of laminations or burnt material shall not develop during the entire flattening process.

(c) The weld shall be placed in the line of maximum bend for Grade A, B, or C tubes.

(d) (1) For grade D tubes a section of the tube not less than 2½ inches in length shall be flattened cold between parallel plates until the opposite walls of the tube meet. No cracks or breaks in the metal shall occur until the distance between the plates is less than the calculated value of H by the following formula:

$$H = \frac{(1+e)t}{e+t/D} \quad (1)$$

where:

H —distance between flattening plates in inches,
 t —nominal wall thickness of tube in inches,
 e —deformation per unit length (constant for a given grade of steel, 0.08 for low carbon grade steels), and
 D —actual outside diameter of tube in inches.

(2) Evidence of laminations or burnt material or incomplete penetration of the weld shall not develop during the entire flattening process.

(3) The weld shall be placed 90° from the line of direction of the applied force.

(e) Superficial ruptures as a result of minor surface imperfections shall not be cause for rejection.

§ 51.28-30 *Flange test.* (a) For grade A, B or C tubes not more than 5 inches in diameter and having wall thicknesses not exceeding 10 percent of their outside diameters, and providing the thickness does not exceed 0.200 inch, a section not less than 4 inches in length shall be capable of having a flange turned over at a right angle to the body of the tube without cracking or showing flaws. This flange as measured from the outside of the tube shall not be less than ¼ inch nor more than ½ inch. Within these limits the width of the flange shall be not less than the amounts prescribed in Table 51.28-30 (a).

TABLE 51.28-30 (a)—FLANGE TEST

Outside diameter of tube, inches	Width of flange	
	Grade A, B, or D	Grade C
2½ and under...	15 percent of outside diameter.	75 percent of that required for grades A and B.
Over 2½ to 3¼...	¾ inch.	
Over 3¼ to 5....	10 percent of outside diameter.	

(b) For grade D tubes a section of the tube not less than 4 inches in length shall be capable of having a flange turned over at a right angle to the body of the tube without cracking or showing flaws. This flange, as measured from the outside of the tube, shall not be less than ¼ inch nor more than ¾ inch. Within these limits the width of the flange shall be not less than the amounts prescribed in Table 51.28-30 (a).

(c) In making the flange test, it is recommended that the flaring tool and die block shown in figure 51.25-20 (c) be used.

§ 51.28-35 *Crush test for grade A or B tubes.* (a) When required by the inspector, crushing tests shall be made on sections of tubes 2½ inches in length which shall stand crushing longitudinally without cracking, splitting, or opening at the weld, as follows:

TABLE 51.28-35 (a)—CRUSH TESTS

Wall thickness of tubes, inches:	
0.135 and under.	
Over 0.135.	
Height of crushed section, inches:	
¾, or until outside folds are in contact.	
1¼.	

(b) Slight surface checks shall not be cause for rejection.

§ 51.28-40 *Tensile properties.* (a) Grade C tubes shall conform to the following requirements as to tensile properties:

TABLE 51.28-40 (a)—PHYSICAL PROPERTIES

Physical requirements:	Ferritic steel
Tensile strength, minimum, p. s. i.	60,000
Yield point, minimum, p. s. i.	37,000
Elongation in 2 inches, minimum, percent	30
For longitudinal strip tests a deduction for each ½ inch decrease in wall thickness below ½ inch from the basic minimum elongation of the following percentage	1.50

¹ The following table gives the computed minimum values:

Wall thickness inches	Elongation in 2 inches, minimum percent (ferritic steel)
5/16 (0.312)	30.00
3/8 (.281)	28.50
1/4 (.250)	27.00
5/32 (.219)	25.50
3/16 (.188)	24.00
5/32 (.156)	22.50
1/8 (.125)	21.00
3/32 (.094)	19.50
1/16 (.062)	18.00

NOTE: The above table gives the computed minimum elongation values for each ½ inch decrease in wall thickness. Where the wall thickness lies between two values shown above, the minimum elongation

value shall be determined by the following formula:

$$E=40t+12.50$$

where:

E =elongation in 2 inches in percent, and
 t =actual thickness of specimen in inches.

(b) No tensile properties are specified for Grade D tubes, but for purposes of design, the following tensile properties may be assumed:

Tensile strength, minimum, p. s. i.	47,000
Yield point, minimum, p. s. i.	26,000
Elongation in 2 inches, minimum, percent.	35

§ 51.28-45 *Reverse bend test for Grade D tubes.* A section 4 inches in length shall be taken every 1,500 feet of finished welded tubing to be split longitudinally 180° from the weld and the sample opened and flattened with the weld at the point of maximum bend. There shall be no evidence of cracks or lack of penetration or overlaps resulting from flash removal in the weld.

§ 51.28-50 *Hardness test for Grade D tubes.* (a) For tubes 0.200 inch and over in wall thickness the Brinell hardness test shall be used and on tubes having wall thicknesses from 0.200 to 0.375 inch, exclusive, a 10-mm. ball with a 1,500-kg. load, or a 5-mm. ball with a 750-kg. load may be used at the option of the inspector. For tubes less than 0.200 inch in wall thickness, the Rockwell hardness test shall be used.

(b) The Brinell hardness test may be made on the outside of the tube near the end or on the outside of a specimen cut from the tube, at the option of the inspector. The Rockwell hardness test shall be made on the inside of a specimen cut from the tube.

(c) The tubes shall have a Brinell hardness number not to exceed 125 and a Rockwell hardness number not to exceed B72.

(d) In making the Brinell hardness test, reference should be made to the Standard Method of Test for Brinell Hardness of Metallic Materials (A. S. T. M. Designation: E 10) of the American Society for Testing Materials.

(e) In making the Rockwell hardness test, reference should be made to the Standard Method of Test for Rockwell Hardness of Metallic Materials (A. S. T. M. Designation: E 18) of the American Society for Testing Materials.

§ 51.28-55 *Hydrostatic test—(a) Grade A, B, or C tubes.* Tubes under 5 inches in diameter shall withstand an internal hydrostatic pressure of 1,000 p. s. i. and tubes 5 inches and over in diameter shall withstand an internal hydrostatic pressure of 800 p. s. i. provided the fiber stress corresponding to these pressures does not exceed 16,000 p. s. i. for Grades A and B, and 18,000 p. s. i. for Grade C, as determined by formula (1) below. Should the fiber stress corresponding to these pressures exceed the above figures, the hydrostatic test pressure shall be determined by the following formula:

$$P = \frac{2St}{D} \quad (1)$$

where:

P =hydrostatic test pressure in pounds per square inch,

S =allowable fiber stress of 16,000 p. s. i. for grades A and B tubes, 18,000 p. s. i. for grade C tubes,

t =thickness of the tube wall in inches, and
 D =outside diameter of the tube in inches.

(b) *Grade D tubes.* Each tube shall be tested at the mill and shall withstand for a minimum of 10 seconds a hydrostatic test pressure which shall impose a minimum fiber stress of 16,000 p. s. i. and not exceeding 24,000 p. s. i., as determined by formula (1) of this section.

(c) *All grade tubes.* Tubes shall be struck near both ends, while under test pressure, with a 2-pound steel hand hammer or its equivalent.

§ 51.28-57 *Nondestructive electric test for grade D tubes.* In lieu of the hydrostatic test, when mutually agreed upon by the purchaser and the manufacturer, each tube shall be tested at the mill by passing through a nondestructive tester which is capable of detecting defects $\frac{1}{16}$ inch in length and one half the wall thickness, or defects of any length completely penetrating the wall. Such tests shall be made on the welded seam and the adjacent metal affected thereby.

§ 51.28-60 *Test specimens.* (a) Test specimens required for the flattening, flange, and flaring tests specified in §§ 51.28-25, 51.28-30, and 51.28-45 shall be taken from the ends of finished tubes prior to upsetting, swaging, expanding, or other forming operations, or being cut to length. They shall be smooth on the ends and free from burrs and flaws.

(b) If desirable and practicable, tension tests may be made on full sections of the tubes up to the capacity of the testing machine. For larger size tubes, the tension-test specimen shall consist of a strip cut longitudinally from the tube and not flattened between gauge marks. The sides of the specimen shall be parallel between gauge marks; the width, irrespective of the thickness, shall be 1 inch; the gauge length shall be 2 inches.

(c) All specimens shall be tested at room temperature.

§ 51.28-65 *Number of tests.* (a) For Grade A or B, one of each of the tests specified in §§ 51.28-25 (a), (b), (d), 51.28-30, and 51.28-35 shall be made on each of 2 tubes from each lot of 250 tubes or fraction thereof, and from each 2,000 feet or fraction thereof of safe-end material. For grade C, one of each of the tests specified in §§ 51.28-25 (c) and (d), 51.28-30, and 51.28-40 shall be made on each of 2 tubes from each lot of 250 tubes or fraction thereof.

(b) If any of the test specimens shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(c) If the percentage of elongation of any tension test specimen is less than that specified in § 51.28-40 (a) and any part of the fracture is more than $\frac{3}{4}$ inch from the center of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

(d) Grade A, B, or C tubes shall be subjected to the hydrostatic test specified in § 51.28-55.

(e) (1) For grade D tubes one flattening test and one flange test, specified in sections 51.28-25 (d) and 51.28-30 (b), shall be made on each of two tubes from

each lot of 250 tubes or fraction thereof. A reverse bend test, specified in § 51.28-45, shall be made on each 1,500 feet of finished tubing.

(2) When properly controlled continuous furnaces are used for heat treatment, 1 percent of all Grade D tubes, but in no case less than 5 tubes, shall be selected and a hardness test shall be made on each of these tubes as specified in § 51.28-50. When heat treatment is performed in a batch type furnace, 5 percent of all tubes shall be so tested as specified in § 51.28-50.

(3) Each Grade D tube shall be subjected to either the hydrostatic or nondestructive electric test required by § 51.28-55 (b) or 51.28-57, as specified.

§ 51.28-70 *Retests.* If the results of the physical tests of any lot do not conform to the requirements specified in § 51.28-25, 51.28-30, 51.28-35, 51.28-40, 51.28-45, and 51.28-50, retests may be made on additional tubes of double the original number from the same lot, each of which shall conform to the requirements specified.

§ 51.28-75 *Forming operations.* Tubes when inserted in the boiler shall stand expanding and beading without showing cracks or flaws, or opening at the weld. Superheater tubes when properly manipulated shall stand all forging, welding, and bending operations necessary for application without developing defects.

§ 51.28-80 *Finish.* Finished tubes shall be reasonably straight and have smooth ends free from burrs. They shall be free from injurious defects and shall have a workmanlike finish.

§ 51.28-85 *Marking—(a) Grade A, B, or C tubes.* The name or brand of the manufacturer, the type of material from which it is made, the words Electric Resistance Welded and whether steel or open-hearth iron, and A. S. T. M. A 178, shall be legibly stenciled on each tube $1\frac{1}{4}$ inches in outside diameter and over, provided the length is not under 3 feet.

(b) *Grade D tubes.* The name or brand of the manufacturer, the words Electric Resistance Welded Steel, A. S. T. M. A 226, shall be legibly stenciled on each tube $1\frac{1}{4}$ inches and over in outside diameter, provided the length is not under 3 feet.

(c) *All grades of tubes.* On tubes less than $1\frac{1}{4}$ inches in diameter and on all tubes under 3 feet in length, the information specified in paragraph (a) or (b), shall be marked on a tag securely attached to the bundle or box in which the tubes are shipped.

SUBPART 51.31—SEAMLESS STEEL BOILER TUBES FOR HIGH-PRESSURE SERVICE, MEDIUM-CARBON SEAMLESS STEEL BOILER AND SUPERHEATER TUBES, SEAMLESS CARBON-MOLYBDENUM ALLOY-STEEL BOILER AND SUPERHEATER TUBES

NOTE: In substantial agreement with A. S. T. M. Designations: A 192-44, A 210-46, and A 209-46.¹ Certified material—class B.

§ 51.31-1 *Scope.* (a) This specification covers seamless steel boiler tubes and superheater tubes for high-pressure

¹ A copy of these A. S. T. M. specifications has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

service, medium-carbon seamless steel tubes intended for boiler and superheater tubes, boiler flues, safe ends, and staytubes, and seamless carbon-molybdenum alloy-steel boiler and superheater tubes.

(b) Seamless steel tubes for high-pressure service less than 2 inches in outside diameter shall have wall thicknesses of not less than 8 percent of the outside diameter and in no case less than 0.085 inch. Tubes 2 inches and over in outside diameter shall have wall thicknesses of not less than 0.200 inch.

§ 51.31-5 *Process*. The steel shall be a killed steel and shall be made by either or both of the following processes: open-hearth or electric-furnace.

TABLE 51.31-15—CHEMICAL COMPOSITION

Chemical elements	High-pressure	Medium-carbon	Carbon-molybdenum		
			Grade T1	Grade T1a	Grade T1b
Carbon, percent.....	0.08 to 0.18	0.35	0.10 to 0.20	0.15 to 0.25	0.08 to 0.14
Manganese, percent.....	.30 to .60	1.80	.30 to .80	.30 to .80	.30 to .80
Phosphorus, maximum, percent.....	.04	.04	.04	.04	.04
Sulfur, maximum, percent.....	.045	.045	.05	.05	.05
Silicon, maximum, percent.....	.25	.50	.50	.50	.50
Silicon, minimum, percent.....		.10	.10	.10	.10
Molybdenum, percent.....		.45 to .65	.45 to .65	.45 to .65	.45 to .65

¹ Maximum.

§ 51.31-20 *Check analysis*. (a) At the request of the inspector an analysis as specified in the following table shall be made by the manufacturer on samples of finished tubing selected at random and shall conform to the requirements specified in section 51.31-15. Drillings for analysis shall be taken from several points around each tube selected for analysis.

TABLE 51.31-20—CHECK ANALYSIS

Size of Tube and Number of Samples Selected
2 inches and over in diameter and 0.200 inch and over in wall thickness: 2 from each lot of 100 tubes or fraction thereof.

Less than 2 inches in diameter or any size less than 0.200 inch in wall thickness: 2 from each lot of 250 tubes or fraction thereof.

(b) If the analysis of either tube does not conform to the requirements specified, an analysis of two additional tubes from the same lot shall be made, each of which shall conform to the requirements specified in § 51.31-15.

§ 51.31-25 *Tensile properties*. (a) The material shall conform to the following requirements as to tensile properties:

TABLE 51.31-25 (a)—PHYSICAL PROPERTIES

Physical requirements	Medium-carbon	Carbon-molybdenum		
		Grade T1	Grade T1a	Grade T1b
Tensile strength, minimum, p. s. i.....	60,000	55,000	60,000	53,000
Yield point, minimum, p. s. i.....	37,000	30,000	32,000	28,000
Elongation in 2 inches, minimum, percent.....	25	30	30	30
For longitudinal strip tests a deduction for each 1/2 inch decrease in wall thickness below 1/4 inch from the basic minimum elongation of the following percentage.....	1.25	1.50	1.50	1.50

¹ The following table gives the computed minimum values:

§ 51.31-10. *Manufacture*. (a) Tubes shall be made by the seamless process and shall be either hot-finished or cold-drawn.

(b) Cold-drawn tubes shall be annealed after the final cold-draw pass.

(c) Hot-finished tubes for high pressure service need not be annealed unless specified by the purchaser.

(d) Hot-finished medium-carbon tubes shall be annealed by heating to at least 1,300° F.

(e) Hot-finished carbon-molybdenum tubes shall be annealed or normalized and drawn.

§ 51.31-15 *Chemical composition*. The steel shall conform to the following requirements as to chemical composition:

parallel plates until the opposite walls of the tube meet. No cracks or breaks in the metal shall occur until the distance between the plates is less than the calculated value of H by the following formula:

$$H = \frac{(1+e)t}{e+t/D} \quad (1)$$

where:

H = distance between flattening plates in inches,

e = deformation per unit length (constant for a given grade of steel, 0.09 for the low-carbon grade, 0.07 for medium-carbon steels, and 0.08 for carbon-molybdenum steels),

t = nominal wall thickness of tube in inches, and

D = actual outside diameter of the tube in inches.

(b) Evidence of laminations or burnt material shall not develop during the entire flattening process.

§ 51.31-35 *Flaring test*. A section of tube approximately 4 inches in length shall stand being flared with a tool having 60° included angle until the tube at the mouth of the flare has been expanded to the following percentages, without cracking or showing flaws:

TABLE 51.31-35—FLARING TEST

Ratio of inside diameter to outside diameter: ¹	Minimum expansion of inside diameter, percent
0.9.....	20
0.8.....	22
0.7.....	25
0.6.....	30
0.5.....	37
0.4.....	50
0.3.....	67

¹ In determining the ratio of inside diameter to outside diameter, the inside diameter shall be defined as the actual inside diameter of the material tested.

§ 51.31-40 *Harness test*. (a) For tubes 0.200 inch and over in wall thickness the Brinell hardness test shall be used and on tubes having wall thicknesses from 0.200 to 0.375 inch, exclusive, a 10-mm. ball with 1,500-kg. load, or a 5-mm. ball with 750-kg. load may be used, at the option of the manufacturer. For tubes less than 0.200 inch in wall thickness, the Rockwell hardness test shall be used, except that for medium-carbon and carbon-molybdenum tubes with wall thicknesses of less than 0.065 inch, no hardness tests are required.

(b) The Brinell hardness test may be made on the outside of the tube near the end or on the outside of a specimen cut from the tube, at the option of the manufacturer. The Rockwell hardness test shall be made on the inside of a specimen cut from the tube except in the case of tubes furnished with upset, swaged, or otherwise formed ends in which case it shall be made on the outside of the tubes near the end after forming operations.

(b) No tensile properties are specified for tubes for high-pressure service, but for purposes of design, the following tensile properties may be assumed:

Tensile strength, minimum, p. s. i..... 47,000
Yield point, minimum, p. s. i..... 26,000
Elongation in 2 inches, minimum, percent..... 35

(c) The yield point shall be determined by the drop of the beam or halt in the gauge of the testing machine, or by the use of dividers or other approved method, at a cross head speed not to exceed 1/4 inch per minute. When a definite yield point is not exhibited, the yield strength corresponding to a limited permanent offset of 0.2 percent of the gauge length of the specimen shall be reported instead. The tensile strength shall be determined at a crosshead speed not to exceed 1 1/2 inches per minute.

§ 51.31-30 *Flattening test*. (a) A section of tube, not less than 2 1/2 inches in length, shall be flattened cold between

(c) The tubes shall have a hardness number not to exceed the following:

TABLE 51.31-40 (c)—HARDNESS TEST

Grades	Brinell hardness number (tubes 0.200 inch and over in wall thickness)	Rockwell hardness number (tubes less than 0.200 inch in wall thickness)
High-pressure service:		
Hot-finished tubes	137	B77
Cold-drawn tubes	125	B72
Hot-finished tubes (annealed)	125	B72
Medium-carbon tubes	143	B79
Carbon-molybdenum tubes:		
Grade T1	137	B77
Grade T1a	143	B79
Grade T1b	137	B77

(d) In making the Brinell hardness test, reference should be made to the Standard Method of Test for Brinell Hardness of Metallic Materials (A. S. T. M. Designation: E 10) of the American Society for Testing Materials.

(e) In making the Rockwell hardness test, reference should be made to the Standard Method of Test for Rockwell Hardness of Metallic Materials (A. S. T. M. Designation: E 18) of the American Society for Testing Materials.

§ 51.31-45 *Hydrostatic test.* Prior to upsetting, swaging, expanding, bending, or other forming operations, each tube shall be tested at the mill to the hydrostatic pressures prescribed in table 51.31-45: *Provided*, That the fiber stress calculated in accordance with the following formula does not exceed 16,000 p. s. i. in the case of tubes for high-pressure and 24,000 p. s. i. for medium-carbon and carbon-molybdenum tubes:

$$P = \frac{2St}{D} \quad (1)$$

where:

P = hydrostatic test pressure in pounds per square inch,

S = allowable fiber stress of 16,000 p. s. i. for high-pressure tubes and 24,000 p. s. i. for medium-carbon and carbon-molybdenum tubes,

t = thickness of the tube wall in inches, and

D = outside diameter of the tube in inches.

TABLE 51.31-45—HYDROSTATIC TEST PRESSURE

Size, outside diameter (inches):	Hydrostatic test pressure (p. s. i.)
Under 1	1,000
1 to 1½, exclusive	1,500
1½ to 2, exclusive	2,000
2 and over	2,500

NOTE: When requested by the purchaser and so stated in the order, tubes shall be tested to one and one-half times the specified working pressure (when one and one-half times the specified working pressure exceeds the test pressures prescribed in above table), provided the fiber stress corresponding to those test pressures does not exceed 24,000 p. s. i. for medium-carbon and carbon-molybdenum tubes and 16,000 p. s. i. for high-pressure tubes, as determined by the above formula.

§ 51.31-50 *Test specimens*—(a) *Tubes for high-pressure service.* (1) Test specimens required for the flattening and flaring tests specified in §§ 51.31-30 and 51.31-35 shall be taken from the

ends of finished tubes prior to upsetting, swaging, expanding, or other forming operations, or being cut to length. They shall be smooth on the ends and free from burrs and flaws.

(2) All specimens shall be tested at room temperature.

(b) *Medium-carbon and carbon-molybdenum tubes.* (1) Test specimens required for the flattening and flaring tests specified in §§ 51.31-30 and 51.31-35 shall be taken from the ends of finished tubes prior to upsetting, swaging, expanding, or other forming operations, or being cut to length. They shall be smooth on the ends and free from burrs and flaws.

(2) If desirable and practicable, tension tests may be made on full sections of the tubes up to the capacity of the testing machine. For larger size tubes, the tension test specimen shall consist of a strip cut longitudinally from the tube and not flattened between gauge marks. The sides of the specimen shall be parallel between gauge marks; the width irrespective of the thickness shall be 1 inch; the gauge length shall be 2 inches.

(3) On tubes furnished with upset, swaged, or otherwise formed ends, the hardness test specified in § 51.31-40 shall be made on the outside of the tubes near the end after the forming operations.

(4) All specimens shall be tested at room temperature.

§ 51.31-55 *Number of tests*—(a) *Hardness test.* Five percent of all tubes shall be selected and a hardness test shall be made on each of these tubes as specified in § 51.31-40.

(b) *Hydrostatic test.* Each tube shall be subjected to the hydrostatic test specified in § 51.31-45.

(c) *Flattening and flaring tests*—(1) *Tubes for high-pressure service.* From each lot of 100 tubes or fraction thereof, 4 tubes shall be selected for test. From each end of two of these test tubes, the flattening test specified in section 51.31-30 shall be made and from each end of the other two test tubes the flaring test specified in section 51.31-35 shall be made.

(2) *Medium-carbon and carbon-molybdenum tubes.* From each heat-treated lot of finished tubes, two tubes shall be selected at random for the flattening and flaring tests specified in sections 51.31-30 and 51.31-35. The flattening test shall be made on each end of one of these tubes and the flaring test shall be made on each end of the remaining tube. For the purpose of calculating the number of tests on tubes heat-treated by the continuous process, the number of tubes in a heat-treated lot shall be determined from the size of the tubes as follows:

TABLE 51.31-55 (c) (2)—NUMBER OF TUBES IN A LOT

Size of Tube and Size of Lot	Number of Tubes
2 inches and over in outside diameter and 0.200 inch and over in wall thickness—Not more than 50 tubes.	
Less than 2 inches but over 1 inch in outside diameter and over 1 inch in outside diameter and under 0.200 inch in wall thickness—Not more than 75 tubes.	
1 inch or less in outside diameter—Not more than 125 tubes.	

(d) *Tension tests (where required).* (1) From each group of 100 finished tubes or fraction thereof, two tubes shall be selected at random for the tension test specified in § 51.31-25.

(2) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(3) If the percentage of elongation of any test specimen is less than that specified in § 51.31-25 (a) and any part of the fracture is more than ¾ inch from the center of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

§ 51.31-60 *Retests.* If the results of the physical tests of any lot do not conform to the requirements specified in §§ 51.31-25, 51.31-30, 51.31-35, and 51.31-40, retests may be made on additional tubes of double the original number from the same lot, each of which shall conform to the requirements specified.

§ 51.31-65 *Retreatment.* If individual tubes or tubes selected to represent any group or lot of medium-carbon or carbon-molybdenum tubes fail to conform to the test requirements specified in §§ 51.31-25, 51.31-30, 51.31-35, and 51.31-40, the individual tubes or group or lot represented may be retreated and resubmitted for test. Only two reheat treatments will be permitted.

§ 51.31-70 *Forming operations.* Tubes when inserted in the boiler shall stand expanding and beading without showing cracks or flaws. Superheater tubes when properly manipulated shall stand all forging, welding, and bending operations necessary for application without developing defects.

§ 51.31-75 *Permissible variations in dimensions and weight.* Variations in outside diameter, wall thickness, weight and length, from those specified, shall not exceed the amounts prescribed in table 51.25-65.

§ 51.31-80 *Finish.* Finished tubes shall be reasonably straight and have smooth ends free from burrs. They shall be free from injurious defects and shall have a workmanlike finish. Minor defects may be removed by grinding. *Provided*, The wall thicknesses and the outside diameters are not decreased to less than that permitted in § 51.31-75.

§ 51.31-85 *Marking.* (a) The name or brand of the manufacturer, the type of material from which it is made (seamless steel, A. S. T. M. A 192, medium-carbon steel, A. S. T. M. A 210, or carbon-molybdenum steel, A. S. T. M. A 209, as the case may be), and whether hot-finished or cold-drawn, shall be legibly stenciled on each tube 1½ inches in outside diameter and over, provided the length is not under 3 feet.

(b) On tubes less than 1½ inches in diameter and on all tubes under 3 feet in length, the information specified in paragraph (a) shall be marked on a tag securely attached to the bundle or box in which the tubes are shipped.

SUPPART 51.34—SEAMLESS STEEL PIPE
 NOTE: In substantial agreement with A. S. T. M. Designations: A 106-46T, A 209-46T, and A 280-46aT. Certified material—Class B.
§ 51.34-1 Scope. This specification covers two grades of seamless carbon-steel pipe, designated grade A or B, one grade of seamless carbon-molybdenum alloy-steel pipe, designated grade P1, and one grade of seamless chromium-molybdenum alloy-steel pipe intended for high temperature service. All grades shall be suitable for bending, flanging, and similar forming operations, and for arc or gas welding. Grade A rather than grade B shall be used for close colling, cold bending, or forge welding.

§ 51.34-5 Process—(a) Carbon-steel pipe. (1) The steel for grade A or B pipe shall be killed steel made by one or more of the following processes: open-hearth or electric-furnace.
 (2) Unless otherwise specified, pipe shall be furnished either hot-finished or cold-drawn with a suitable process anneal. This anneal shall consist of heating in a furnace to approximately 1,200° F. followed by furnace cooling at a rate not to exceed 50° F. per hour until below 1,000° F.

(3) Unless otherwise specified, pipe under 2 inches in nominal diameter may be furnished either hot-finished or cold-drawn with a suitable process anneal. This anneal shall consist of heating in a furnace from 1,200° F. to 1,300° F. followed by furnace cooling at a rate not to exceed 50° F. per hour until below 1,000° F.

§ 51.34-10 Chemical composition. (a) The steel shall conform to the following requirements as to chemical composition:

TABLE 51.34-10 (a)—CHEMICAL COMPOSITION

Chemical elements	Grade A	Grade B	Carbon-molybdenum P1	Chromium-molybdenum
Carbon	Percent 0.25 to .30	Percent 0.30 to .35	Percent 0.10 to 0.20 to .30	Percent 0.10 to 0.20 to .30
Manganese	Percent 0.30 to .60	Percent 0.30 to .60	Percent 0.30 to .60	Percent 0.30 to .60
Phosphorus, maximum	.04	.04	.04	.04
Sulfur, maximum	.06	.06	.06	.06
Silicon	Percent 0.10	Percent 0.10	Percent 0.10 to .20	Percent 0.10 to .20
Nickel	Percent 0.10	Percent 0.10	Percent 0.10 to .20	Percent 0.10 to .20
Chromium	Percent 0.10	Percent 0.10	Percent 0.10 to .20	Percent 0.10 to .20

1 Maximum.
 2 Minimum.

(b) **Check analysis.** (1) Analysis of two pipes from each lot, as specified below, shall be made by the manufacturer from the finished pipe.

TABLE 51.34-10 (b) (1)—CHECK ANALYSIS

Nominal diameter (inches)	Grade A or B	Carbon-molybdenum, P1	Chromium-molybdenum
Under 2	400 or fraction thereof.	400 or fraction thereof.	400 or fraction thereof.
2 to 5, inclusive	200 or fraction thereof.	200 or fraction thereof.	200 or fraction thereof.
6 and over	100 or fraction thereof.	100 or fraction thereof.	100 or fraction thereof.

1 Copies of these A. S. T. M. specifications have been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

(2) Drillings for analysis shall be taken from several points around each pipe selected for analysis. The chemical composition thus determined shall conform to the requirements prescribed in paragraph (a).

§ 51.34-15 Tensile requirements. (a) The material shall conform to the following requirements as to tensile properties at room temperature:

TABLE 51.34-15 (a)—PHYSICAL PROPERTIES

Physical requirements	Grade A	Grade B	Carbon-molybdenum and chromium-molybdenum
Tensile strength, minimum, p. s. i.	48,000	60,000	55,000
Yield point, minimum, p. s. i.	30,000	35,000	30,000
Elongation in 2 inches, minimum, percent:			
Basic minimum elongation for walls, 5/16 inch and over in thickness, strip tests, and for all small sizes tested in full section.	25	30	20
When standard round 2-inch gauge length test specimen is used.	20	22	14
For strip tests, a deduction for each 1/2 inch decrease in wall thickness below 5/16 inch from the basic minimum elongation of the following percentage.	11.75	11.50	11.00

1 The following table gives the computed minimum values:

Wall thickness, (inches)	Elongation in 2 inches, minimum, (percent)			
	Grade A		Grade B	
	Longitudinal	Transverse	Longitudinal	Transverse
5/16 (0.312)	35.00	25.00	30.00	16.50
3/8 (.375)	33.25	23.75	28.00	15.50
1/2 (.500)	31.50	22.50	27.00	14.50
5/8 (.625)	29.75	21.25	26.00	13.50
3/4 (.750)	28.00	20.00	25.00	12.50
7/8 (.875)	26.25	18.75	24.00	11.50
1 (.000)	24.50	17.50	23.00	10.50
1 1/8 (1.125)	22.75	16.25	21.00	9.50
1 1/4 (1.250)	21.00	15.00	19.00	8.50

NOTE: The above table gives the computed minimum elongation values for each 1/2 inch decrease in wall thickness. Where the wall thickness lies between two values shown above, the minimum elongation value shall be determined by the following formulas:
 Grade and direction of test:

A—Longitudinal	$E = 56 + 17.50$
A—Transverse	$E = 49 + 12.50$
B—Longitudinal	$E = 48 + 15.00$
B—Transverse	$E = 32 + 4.50$
P1—Longitudinal	$E = 48 + 15.00$
P1—Transverse	$E = 32 + 10.00$

Where:
 E=minimum elongation in 2 inches in percent, and
 t=actual thickness of specimen in inches.

(b) The yield point shall be determined inch per minute. When a definite yield point is not exhibited, the yield strength, by the drop of the beam or halt in the gauge of the testing machine, or by the corresponding to a limiting permanent offset of 0.2 percent of the gauge length use of dividers or other approved method, of the specimen shall be used instead.

The tensile strength shall be determined at a crosshead speed not to exceed 1½ inches per minute.

§ 51.34-20 *Bending properties.* For pipe 2 inches and under in nominal diameter, a sufficient length of pipe shall stand being bent cold through 90° around a cylindrical mandrel, the diameter of which is 12 times the nominal diameter of the pipe without developing cracks. When ordered for close coiling, the pipe shall stand being bent cold through 180° around a cylindrical mandrel, the diameter of which is eight times the nominal diameter of the pipe, without failure.

§ 51.34-25 *Flattening tests.* (a) For pipe over 2 inches in nominal diameter a section of pipe not less than 2½ inches in length shall be flattened cold between parallel plates until the opposite walls of the pipe meet. No cracks or breaks in the metal shall occur until the distance between the plates is less than that calculated for the value of H by the following formula:

$$H = \frac{(1+e)t}{e+t/D} \quad (1)$$

where:

- H = distance between flattening plates in inches,
 t = nominal wall thickness of pipe in inches,
 D = actual outside diameter of pipe in inches, and
 e = deformation per unit length (constant for a given grade of steel, 0.08 for grade A, 0.07 for grade B, and 0.08 for carbon-molybdenum P1 and chromium-molybdenum).

(b) Evidence of laminations or burnt material shall not develop during the entire flattening process.

§ 51.34-30 *Hydrostatic test.* (a) Each length of pipe shall be tested by the manufacturer to a hydrostatic pressure which will produce in the pipe wall a stress of 50 percent of the minimum specified yield point at room temperature, determined by the following formula:

$$P = \frac{2St}{D}$$

where:

- P = minimum hydrostatic test pressure in pounds per square inch,
 S = 0.50 times the minimum specified yield point at room temperature in pounds per square inch,
 t = nominal wall thickness in inches, and
 D = outside diameter in inches.

(b) The maximum hydrostatic test pressure shall not exceed 2,500 p. s. i. for nominal sizes 3 inches and under, or 2,800 p. s. i. for all nominal sizes over 3 inches. The test pressure shall be maintained for not less than 5 seconds.

NOTE: When requested by the purchaser and so stated in the order, pipe in sizes 14 inches in nominal diameter and smaller shall be tested to one and one-half times the specified working pressure, provided the fiber stress corresponding to those test pressures does not exceed one half the minimum specified yield point of the material, as determined by the above formula. When one and one-half times the working pressure exceeds 2,800 p. s. i., the hydrostatic test pressure shall be a matter of agreement between the purchaser and the manufacturer.

§ 51.34-35 *Test specimens.* (a) Specimens cut either longitudinally or trans-

versely, shall be acceptable for the tension test.

(b) The longitudinal tension test may be made in full section of the pipe up to the capacity of the testing machine. For larger sizes, the tension test specimens shall consist of strips cut from the pipe. The width of these specimens shall be 1½ inches and they shall have a gauge length of 2 inches. When the pipe wall thickness exceeds ¼ inch, the tension test specimen shown in figure 51.04-35 (f) shall be used. Longitudinal tension test specimens shall not be flattened between gauge marks. The sides of specimens shall be parallel between gauge marks.

(c) The transverse tension test may be made on pipe 8 inches and over in nominal diameter. Specimens may be taken from a ring cut from the pipe or from sections resulting from the flattening tests. The specimens shall consist of a strip cut transversely from the pipe; the width of the specimen shall be 1½ inches and its gauge length 2 inches. When the pipe wall thickness exceeds ¼ inch, the tension test specimen shown in figure 51.04-35 (f) shall be used. Specimens cut from the ring section shall be flattened cold and heat treated in the same manner as the pipe and shall be parallel between gauge marks. The transverse tension test specimens may be machined off on either surface provided not over 15 percent of the nominal thickness is removed from either side.

(d) Test specimens for the bend and flattening tests shall consist of sections cut from a pipe. Specimens for flattening tests shall be smooth on the ends and free from burrs, except when made on crop ends.

(e) All routine check tests shall be made at room temperature.

§ 51.34-40 *Number of tests—(a) Grade A or B pipe.* (1) One of either of the tests specified in section 51.34-15 shall be made on one length of pipe from each lot of 400 lengths or fraction thereof of each size under 6 inches, and from each lot of 200 lengths or fraction thereof of each size 6 inches and over.

(2) The flattening test specified in § 51.34-25 shall be made on one length of pipe from each lot of 400 lengths or fraction thereof of each size over 2 inches up to but not including 6 inches and from each lot of 200 lengths or fraction thereof of each size 6 inches and over.

(3) For pipe 2 inches and under in nominal diameter, the bend test specified in § 51.34-20 shall be made on one pipe from each lot of 400 lengths or fraction thereof of each size.

(b) *Carbon-molybdenum and chromium-molybdenum pipe.* (1) Tests shall be made as follows on one pipe from each heat-treated lot, but in no case on less than 5 percent of the pipe ordered:

(i) The transverse or longitudinal tension test specified in § 51.34-15;

(ii) The bend test specified in § 51.34-20 for pipe 2 inches and under in nominal diameter; and,

(iii) The flattening test specified in § 51.34-25 for pipe over 2 inches in nominal diameter.

(2) For material heat treated by the continuous process, the tests specified in subparagraph (1) shall be made on each pipe in a lot constituting 5 percent of the pipe ordered, but on not less than 2 pipes.

(c) *Hydrostatic tests.* Each length of pipe shall be subjected to the hydrostatic tests specified in § 51.34-30.

(d) *Tension tests.* (1) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(2) If the percentage of elongation of any test specimen is less than that specified in § 51.34-15 (a) and any part of the fracture is more than ¼ inch from the center of the gauge length of a 2-inch specimen, or is outside the middle third of the gauge length of an 8-inch specimen, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed. If a specimen breaks in an inside or outside surface flaw, a retest shall be allowed.

§ 51.34-45 *Retests—(a) Grade A or B pipe.* (1) If the results of any chemical or physical tests of any lot do not conform to the requirements specified in §§ 51.34-10, 51.34-15, 51.34-20, and 51.34-25, retests shall be made on additional pipe of double the original number from the same lot, each of which shall conform to the requirements specified.

(2) Should a crop end of a finished pipe fail in the flattening test, one retest may be made from the failed end. Pipe may be normalized either before or after the first test, but pipe shall be subjected to only two normalizing treatments.

(b) *Carbon-molybdenum and chromium-molybdenum pipe.* (1) If the results of any physical tests of any lot do not conform to the requirements specified in §§ 51.34-15, 51.34-20, and 51.34-25, retests shall be made on additional pipes of double the original number from the same lot, each of which shall conform to the requirements specified.

(2) If individual lengths of pipe selected to represent any lot fail to conform to the test requirements specified in §§ 51.34-15, 51.34-20, and 51.34-25, the lot may be reheat-treated and resubmitted for test, except that any individual lengths which meet the requirements before retreating will be accepted.

§ 51.34-50 *Finish and marking.* (a) The finished pipe shall be reasonably straight and free from injurious defects, and shall have a workmanlike finish. Variations in outside diameter shall not exceed the following:

TABLE 51.34-50 (a)—PERMISSIBLE VARIATIONS IN DIAMETER

Nominal pipe size, inches	Permissible variation in outside diameter, inches	
	Over	Under
¾ to 1½, inclusive.....	¼ (0.015)	¼ (0.031)
Over 1½ to 4, inclusive.....	¼ (0.031)	¼ (0.031)
Over 4 to 8, inclusive.....	¼ (0.062)	¼ (0.031)
Over 8 to 18, inclusive.....	¼ (0.094)	¼ (0.031)

* A lot shall consist of all the pipe of the same size and wall thickness from any one melt.

(b) The minimum wall thickness at any point shall not be more than 12.5 percent under the nominal wall thickness specified in table 51.37-55 (a).

(c) Each length of pipe manufactured in accordance with this specification shall be legibly marked, either by stenciling, stamping, or rolling, with the manufacturer's name or brand, together with the designation A 106-A (or A 106-B depending on the grade of steel used), A 206, or A 280, and the hydrostatic test pressure.

SUBPART 51.37—WELDED AND SEAMLESS STEEL PIPE

NOTE: In substantial agreement with A. S. T. M. Designation: A 53-49.¹ Certified material—class B.

§ 51.37-1 Scope—(a) General. This specification covers black and hot-dipped-galvanized welded and seamless steel pipe.

(1) Pipe ordered under this specification is nominal (average) wall and is intended for coiling, bending, flanging, and other special purposes, and is suitable for arc or gas welding.

(2) Butt-welded pipe is not intended for flanging.

(3) When seamless or electric-resistance-welded pipe is ordered for close coiling, cold bending, or for forge welding, grade A shall be specified, as grade B and deoxidized acid-bessemmer pipe² are not intended for these purposes.

(4) The purposes for which the pipe is intended should be stated in the order.

(b) Galvanized pipe. When pipe ordered under this specification is to be galvanized, the tension, flattening, and bend tests shall be made on the base material before galvanizing.

NOTE: If impracticable to make the physical tests on the base material before galvanizing, such tests may be made on galvanized samples, and any flaking or cracking of the zinc coating shall not be considered cause for rejection.

§ 51.37-5 Process. (a) The steel for both welded and seamless pipe shall be made by one or more of the following processes: open-hearth, electric-furnace, or deoxidized acid-bessemmer,² except that electric-resistance-welded pipe $\frac{1}{8}$ and $\frac{1}{4}$ inch in diameter shall be made from open-hearth steel. The steel for furnace-welded pipe shall be of soft weldable quality.

(b) Furnace-welded pipe 4 inches and under in nominal diameter may be butt-welded, unless otherwise specified. Furnace-welded pipe over 4 inches in nominal diameter shall be lap-welded.

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

² Deoxidized bessemmer steel for seamless pipe is an acid bessemmer steel which has a considerable portion of dissolved oxygen removed as a gas by treatment in the vessel and further treatment in the ladle to develop a silicon content of 0.10 to 0.30 percent and with sufficient aluminum or its equivalent to insure practically no evolution of gases during solidification.

§ 51.37-10 Chemical composition. The steel shall conform to the following ladle analysis requirement as to chemical composition:

TABLE 51.37-10—CHEMICAL COMPOSITION

Chemical elements	Lap-welded	Seamless or electric-resistance-welded
Carbon, maximum, percent		(¹)
Phosphorus, maximum, percent		
Open-hearth or electric-furnace	0.06	0.045
Deoxidized acid-bessemmer		.11

¹ Electric-resistance-welded pipe $\frac{1}{8}$ and $\frac{1}{4}$ inch in diameter is obtainable in grade A quality only and the carbon content shall not exceed 0.10 percent.

§ 51.37-15 Check analysis. An analysis of 2 pipes from each lot of 500 lengths or fraction thereof may be made by the inspector. Drillings for analysis shall be taken from several points around each pipe selected for analysis. The phosphorus content of open-hearth or electric-furnace steel thus determined shall not exceed that specified in § 51.37-10 by more than 25 percent. For deoxidized acid-bessemmer seamless or electric-resistance-welded steel pipe, the phosphorus content shall not exceed the maximum specified in § 51.37-10. For electric-resistance-welded pipe $\frac{1}{8}$ and $\frac{1}{4}$ inch in diameter, the carbon content shall not exceed 0.12 percent.

§ 51.37-20 Tensile properties. (a) The material shall conform to the requirements as to tensile properties prescribed in the following table:

TABLE 51.37-20 (a)—PHYSICAL PROPERTIES

Physical requirements	Furnace-welded		Seamless or electric-resistance-welded ¹	
	Acid-bessemmer	Open-hearth or electric-furnace	Grade A	Grade B
Tensile strength, minimum, p.s.i.	50,000	45,000	48,000	60,000
Yield point, minimum, p.s.i.	30,000	25,000	30,000	35,000
Elongation in 8 inches, minimum, percent	18	20	-----	-----
Elongation in 2 inches, minimum, percent:				
Basic minimum elongation for walls $\frac{1}{16}$ inch and over in thickness, longitudinal strip tests, and for all small sizes tested in full section			35	30
When standard round 2-inch gauge length test specimen is used		30	28	22
For longitudinal strip tests a deduction for each $\frac{1}{16}$ inch decrease in wall thickness below $\frac{1}{16}$ inch from the basic minimum elongation of the following percentage			1.75	1.80

¹ Tension tests shall not be required for electric-resistance-welded pipe $\frac{1}{8}$ and $\frac{1}{4}$ inch in diameter.

² Gauge distances for measuring elongation on furnace-welded pipe of nominal sizes $\frac{1}{4}$ inch and smaller shall be as follows:

Nominal size, inch:	Gauge length, inches
$\frac{1}{8}$ and $\frac{1}{4}$	6
$\frac{3}{8}$ and $\frac{1}{2}$	4
$\frac{5}{8}$	2

³ The following table gives the computed minimum values:

Wall thickness, inches	Elongation in 2 inches, minimum, percent	
	Grade A	Grade B
$\frac{1}{8}$ (0.312)	35.00	30.00
$\frac{1}{4}$ (.250)	33.25	28.50
$\frac{3}{8}$ (.219)	31.50	27.00
$\frac{1}{2}$ (.188)	29.75	25.50
$\frac{5}{8}$ (.156)	28.00	24.00
$\frac{3}{4}$ (.125)	26.25	22.50
$\frac{7}{8}$ (.094)	24.50	21.00
$\frac{1}{2}$ (.062)	22.75	19.50
	21.00	18.00

NOTE: The above table gives the computed minimum elongation values for each $\frac{1}{16}$ inch decrease in wall thickness. Where the wall thickness lies between two values shown above, the minimum elongation value shall be determined by the following formula:

$$\text{Grade A: } E = 56t + 17.50$$

$$\text{Grade B: } E = 48t + 15.00$$

where:
E = elongation in 2 inches in percent, and
t = actual thickness of specimen in inches.

§ 51.37-25 Bending properties. For pipe 2 inches and under in nominal diameter, a sufficient length of pipe shall stand being bent cold through 90° around a cylindrical mandrel, the diameter of which is 12 times the nominal diameter of the pipe, without developing cracks at any portion and without opening the weld. When ordered for close coiling, the pipe shall stand being bent cold through 180° around a cylindrical mandrel, the diameter of which is eight times the nominal diameter of the pipe without failure. Double extra strong pipe over 1 $\frac{1}{4}$ inches in diameter need not be subjected to the bend test.

§ 51.37-30 Flattening test. (a) The flattening test shall be made on standard weight and extra strong pipe over 2 inches in nominal diameter. It shall not be required for double extra strong pipe.

(b) For lap-welded and butt-welded pipe, the test section shall be 4 to 6 inches in length and the weld shall be located 45° from the line of direction of the applied force.

(c) For electric-resistance-welded pipe, the test section shall be 4 to 6 inches in length and the weld shall be located 90° from the line of direction of the applied force.

(d) For seamless pipe the test section shall not be less than 2 $\frac{1}{2}$ inches in length.

(e) The test shall consist in flattening a section of pipe between parallel plates until the opposite walls meet. For welded pipe, no opening in the weld shall take place until the distance between the plates is less than three-fourths of the original outside diameter for butt-weld, or two-thirds the outside diameter for lap-weld and electric-resistance-weld, and no cracks or breaks in the metal elsewhere than in the weld shall occur until the distance between the plates is less than shown below. For seamless pipe no breaks or cracks in the metal shall occur until the distance

§ 51.37-55 *Standard weights.* (a) The standard weights with the corresponding wall thicknesses for pipe of various nominal inside diameters are prescribed in table 51.37-55 (a).

TABLE 51.37-55 (a)—STANDARD WEIGHTS AND DIMENSIONS OF WELDED AND SEAMLESS STEEL PIPE¹

[Where more than one weight is listed under the same size and class, the order should definitely specify the wall thickness desired]

Size (nominal inside diam ^{er}), inches	Out- side diam- eter, inches	Num- ber of threads per inch	"Standard weight" pipe			"Extra strong" pipe			"Double extra strong" pipe ⁴	
			Schedule 30		Schedule 40	Schedule 60		Schedule 80		
			Thick- ness, inches	Weight of pipe per linear foot thread- ed with coup- lings, pounds	Thick- ness, inches	Weight of pipe per linear foot thread- ed and with coup- lings, pounds	Thick- ness, inches	Weight of pipe per linear foot, plain ends, pounds		Thick- ness, inches	Weight of pipe per linear foot, ends, pounds
3/8	0.405	27	0.068	0.25	0.068	0.25	0.065	0.31	0.204	1.71
1/2	0.405	18	0.088	0.43	0.088	0.57	0.119	0.54	0.368	2.44
3/4	0.405	18	0.091	0.57	0.091	0.85	0.126	0.74	0.368	2.44
1	0.405	14	0.109	0.85	0.109	1.13	0.147	1.09	0.368	2.44
1 1/4	0.405	11	0.133	1.13	0.133	1.38	0.179	1.47	0.368	2.44
1 1/2	0.405	11	0.140	1.40	0.140	1.79	0.201	1.91	0.368	2.44
1 3/4	0.405	11	0.145	1.73	0.145	2.23	0.201	2.00	0.368	2.44
2	0.405	8	0.154	2.06	0.154	2.68	0.218	2.18	0.368	2.44
2 1/4	0.405	8	0.203	3.82	0.203	4.62	0.276	2.76	0.368	2.44
2 1/2	0.405	8	0.216	4.62	0.216	5.62	0.290	2.90	0.368	2.44
2 3/4	0.405	8	0.237	5.62	0.237	6.80	0.320	3.20	0.368	2.44
3	0.405	8	0.258	6.80	0.258	8.18	0.348	3.48	0.368	2.44
3 1/4	0.405	8	0.280	8.18	0.280	9.81	0.377	3.77	0.368	2.44
3 1/2	0.405	8	0.307	9.81	0.307	11.81	0.400	4.00	0.368	2.44
3 3/4	0.405	8	0.322	11.81	0.322	14.13	0.420	4.20	0.368	2.44
4	0.405	8	0.345	14.13	0.345	16.81	0.439	4.39	0.368	2.44
4 1/4	0.405	8	0.375	16.81	0.375	20.71	0.450	4.50	0.368	2.44
4 1/2	0.405	8	0.397	19.81	0.397	24.81	0.460	4.60	0.368	2.44
4 3/4	0.405	8	0.420	23.81	0.420	29.41	0.470	4.70	0.368	2.44
5	0.405	8	0.440	27.81	0.440	34.41	0.480	4.80	0.368	2.44
5 1/4	0.405	8	0.463	31.81	0.463	39.81	0.490	4.90	0.368	2.44
5 1/2	0.405	8	0.485	35.81	0.485	45.81	0.500	5.00	0.368	2.44
5 3/4	0.405	8	0.507	39.81	0.507	51.81	0.510	5.10	0.368	2.44
6	0.405	8	0.529	43.81	0.529	57.81	0.520	5.20	0.368	2.44
6 1/4	0.405	8	0.552	47.81	0.552	63.81	0.530	5.30	0.368	2.44
6 1/2	0.405	8	0.574	51.81	0.574	69.81	0.540	5.40	0.368	2.44
6 3/4	0.405	8	0.597	55.81	0.597	75.81	0.550	5.50	0.368	2.44
7	0.405	8	0.619	59.81	0.619	81.81	0.560	5.60	0.368	2.44
7 1/4	0.405	8	0.642	63.81	0.642	87.81	0.570	5.70	0.368	2.44
7 1/2	0.405	8	0.664	67.81	0.664	93.81	0.580	5.80	0.368	2.44
7 3/4	0.405	8	0.687	71.81	0.687	99.81	0.590	5.90	0.368	2.44
8	0.405	8	0.709	75.81	0.709	105.81	0.600	6.00	0.368	2.44
8 1/4	0.405	8	0.732	79.81	0.732	111.81	0.610	6.10	0.368	2.44
8 1/2	0.405	8	0.754	83.81	0.754	117.81	0.620	6.20	0.368	2.44
8 3/4	0.405	8	0.777	87.81	0.777	123.81	0.630	6.30	0.368	2.44
9	0.405	8	0.799	91.81	0.799	129.81	0.640	6.40	0.368	2.44
9 1/4	0.405	8	0.822	95.81	0.822	135.81	0.650	6.50	0.368	2.44
9 1/2	0.405	8	0.844	99.81	0.844	141.81	0.660	6.60	0.368	2.44
9 3/4	0.405	8	0.867	103.81	0.867	147.81	0.670	6.70	0.368	2.44
10	0.405	8	0.889	107.81	0.889	153.81	0.680	6.80	0.368	2.44
10 1/4	0.405	8	0.912	111.81	0.912	159.81	0.690	6.90	0.368	2.44
10 1/2	0.405	8	0.934	115.81	0.934	165.81	0.700	7.00	0.368	2.44
10 3/4	0.405	8	0.957	119.81	0.957	171.81	0.710	7.10	0.368	2.44
11	0.405	8	0.979	123.81	0.979	177.81	0.720	7.20	0.368	2.44
11 1/4	0.405	8	1.002	127.81	1.002	183.81	0.730	7.30	0.368	2.44
11 1/2	0.405	8	1.024	131.81	1.024	189.81	0.740	7.40	0.368	2.44
11 3/4	0.405	8	1.047	135.81	1.047	195.81	0.750	7.50	0.368	2.44
12	0.405	8	1.069	139.81	1.069	201.81	0.760	7.60	0.368	2.44
12 1/4	0.405	8	1.092	143.81	1.092	207.81	0.770	7.70	0.368	2.44
12 1/2	0.405	8	1.114	147.81	1.114	213.81	0.780	7.80	0.368	2.44
12 3/4	0.405	8	1.137	151.81	1.137	219.81	0.790	7.90	0.368	2.44
13	0.405	8	1.159	155.81	1.159	225.81	0.800	8.00	0.368	2.44
13 1/4	0.405	8	1.182	159.81	1.182	231.81	0.810	8.10	0.368	2.44
13 1/2	0.405	8	1.204	163.81	1.204	237.81	0.820	8.20	0.368	2.44
13 3/4	0.405	8	1.227	167.81	1.227	243.81	0.830	8.30	0.368	2.44
14	0.405	8	1.249	171.81	1.249	249.81	0.840	8.40	0.368	2.44
14 1/4	0.405	8	1.272	175.81	1.272	255.81	0.850	8.50	0.368	2.44
14 1/2	0.405	8	1.294	179.81	1.294	261.81	0.860	8.60	0.368	2.44
14 3/4	0.405	8	1.317	183.81	1.317	267.81	0.870	8.70	0.368	2.44
15	0.405	8	1.339	187.81	1.339	273.81	0.880	8.80	0.368	2.44
15 1/4	0.405	8	1.362	191.81	1.362	279.81	0.890	8.90	0.368	2.44
15 1/2	0.405	8	1.384	195.81	1.384	285.81	0.900	9.00	0.368	2.44
15 3/4	0.405	8	1.407	199.81	1.407	291.81	0.910	9.10	0.368	2.44
16	0.405	8	1.429	203.81	1.429	297.81	0.920	9.20	0.368	2.44
16 1/4	0.405	8	1.452	207.81	1.452	303.81	0.930	9.30	0.368	2.44
16 1/2	0.405	8	1.474	211.81	1.474	309.81	0.940	9.40	0.368	2.44
16 3/4	0.405	8	1.497	215.81	1.497	315.81	0.950	9.50	0.368	2.44
17	0.405	8	1.519	219.81	1.519	321.81	0.960	9.60	0.368	2.44
17 1/4	0.405	8	1.542	223.81	1.542	327.81	0.970	9.70	0.368	2.44
17 1/2	0.405	8	1.564	227.81	1.564	333.81	0.980	9.80	0.368	2.44
17 3/4	0.405	8	1.587	231.81	1.587	339.81	0.990	9.90	0.368	2.44
18	0.405	8	1.609	235.81	1.609	345.81	1.000	10.00	0.368	2.44
18 1/4	0.405	8	1.632	239.81	1.632	351.81	1.010	10.10	0.368	2.44
18 1/2	0.405	8	1.654	243.81	1.654	357.81	1.020	10.20	0.368	2.44
18 3/4	0.405	8	1.677	247.81	1.677	363.81	1.030	10.30	0.368	2.44
19	0.405	8	1.699	251.81	1.699	369.81	1.040	10.40	0.368	2.44
19 1/4	0.405	8	1.722	255.81	1.722	375.81	1.050	10.50	0.368	2.44
19 1/2	0.405	8	1.744	259.81	1.744	381.81	1.060	10.60	0.368	2.44
19 3/4	0.405	8	1.767	263.81	1.767	387.81	1.070	10.70	0.368	2.44
20	0.405	8	1.789	267.81	1.789	393.81	1.080	10.80	0.368	2.44
20 1/4	0.405	8	1.812	271.81	1.812	399.81	1.090	10.90	0.368	2.44
20 1/2	0.405	8	1.834	275.81	1.834	405.81	1.100	11.00	0.368	2.44
20 3/4	0.405	8	1.857	279.81	1.857	411.81	1.110	11.10	0.368	2.44
21	0.405	8	1.879	283.81	1.879	417.81	1.120	11.20	0.368	2.44
21 1/4	0.405	8	1.902	287.81	1.902	423.81	1.130	11.30	0.368	2.44
21 1/2	0.405	8	1.924	291.81	1.924	429.81	1.140	11.40	0.368	2.44
21 3/4	0.405	8	1.947	295.81	1.947	435.81	1.150	11.50	0.368	2.44
22	0.405	8	1.969	299.81	1.969	441.81	1.160	11.60	0.368	2.44
22 1/4	0.405	8	1.992	303.81	1.992	447.81	1.170	11.70	0.368	2.44
22 1/2	0.405	8	2.014	307.81	2.014	453.81	1.180	11.80	0.368	2.44
22 3/4	0.405	8	2.037	311.81	2.037	459.81	1.190	11.90	0.368	2.44
23	0.405	8	2.059	315.81	2.059	465.81	1.200	12.00	0.368	2.44
23 1/4	0.405	8	2.082	319.81	2.082	471.81	1.210	12.10	0.368	2.44
23 1/2	0.405	8	2.104	323.81	2.104	477.81	1.220	12.20	0.368	2.44
23 3/4	0.405	8	2.127	327.81	2.127	483.81	1.230	12.30	0.368	2.44
24	0.405	8	2.149	331.81	2.149	489.81	1.240	12.40	0.368	2.44
24 1/4	0.405	8	2.172	335.81	2.172	495.81	1.250	12.50	0.368	2.44
24 1/2	0.405	8	2.194	339.81	2.194	501.81	1.260	12.60	0.368	2.44
24 3/4	0.405	8	2.217	343.81	2.217	507.81	1.270	12.70	0.368	2.44
25	0.405	8	2.239	347.81	2.239	513.81	1.280	12.80	0.368	2.44
25 1/4	0.405	8	2.262	351.81	2.262	519.81	1.290	12.90	0.368	2.44
25 1/2	0.405	8	2.284	355.81	2.284	525.81	1.300	13.00	0.368	2.44
25 3/4	0.405	8	2.307	359.81	2.307	531.81	1.310	13.10	0.368	2.44
26	0.405	8	2.329	363.81	2.329	537.81	1.320	13.20	0.368	2.44
26 1/4	0.405	8	2.352	367.81	2.352	543.81	1.330	13.30	0.368	2.44
26 1/2	0.405	8	2.374	371.81	2.374	549.81	1.340	13.40	0.368	

(b) Extra strong and double extra strong pipe shall be in random lengths of 12 to 22 feet. Five percent may be in lengths of 6 to 12 feet.

§ 51.37-70 *Workmanship*. Unless otherwise specified, pipe shall conform to the following regular practice:

(a) *Ends*. Each end of standard weight welded pipe shall be threaded. Extra strong welded pipe and standard weight and extra strong seamless pipe and all double extra strong pipe shall be furnished with plain ends.

(b) *Threads*. All threads shall be in accordance with the American Standard for Pipe Threads, and cut so as to make a tight joint when the pipe is tested at the mill to the specified internal hydrostatic pressure. The variation from the standard, when tested with the standard working gauge, shall not exceed one and one-half turns either way.

(c) *Couplings*. Each length of threaded pipe shall be provided with one coupling, the thread of which shall be in accordance with the American Standard for Pipe Threads. Threads shall be cut to make a tight joint. Couplings may be of wrought iron or steel.

§ 51.37-75 *Finish*. The finished pipe shall be reasonably straight and free from injurious defects. All burrs at the ends of the pipe shall be removed.

§ 51.37-80 *Marking*. Each length of pipe shall be legibly marked by rolling, stamping, or stenciling to show the name or brand of the manufacturer; the type of pipe (that is, lap-welded, electric-resistance-welded A, electric-resistance-welded B, seamless A, or seamless B; where deoxidized acid-bessemer steel is used in seamless or electric-resistance-welded pipe, the word "bessemer" shall be added before the letter A or B); XS for extra strong, XXS for double extra strong; ASTM A 53; the length; except that for small diameter pipe which is bundled, this information may be marked on a tag securely attached to each bundle.

§ 51.37-85 *Inspection*. The inspector shall have free entry, at all times while work is being performed, to all parts of the manufacturer's works that concern the manufacture of the material ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. All tests (except check analysis) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

§ 51.37-90 *Rejection*. Each length of pipe that develops injurious defects during shop working or application operations shall be rejected, and the manufacturer shall be notified.

SUBPART 51.40—ELECTRIC-RESISTANCE-WELDED STEEL PIPE

NOTE: In substantial agreement with A. S. T. M. Designation: A 135-46.¹ Certified material—class B.

§ 51.40-1 *Scope*. This specification covers two grades of electric-resistance-welded steel pipe 30 inches and under in diameter, designated grade A or B. The pipe is intended for conveying liquid, gas, or vapor; and only grade A is adapted for flanging and bending. The suitability of pipe for various purposes is somewhat dependent upon its dimensions, properties, and conditions of service, so that the purpose for which the pipe is intended should be stated in the order.

§ 51.40-5 *Process*. Unless otherwise specified, the steel shall be made by either or both of the following processes: open-hearth or electric-furnace.

§ 51.40-10 *Chemical composition*. The steel shall conform to the following requirements as to chemical composition:

	Percent
Phosphorous, maximum	0.045
Sulfur, maximum	.060

§ 51.40-15 *Ladle analysis*. An analysis of each melt of steel shall be made by the manufacturer to determine the percentages of the elements specified in § 51.40-10. This analysis shall be made from a test ingot taken during the pouring of the melt. When requested by the inspector, the chemical composition thus determined shall be reported to the inspector and shall conform to the requirements specified in § 51.40-10.

§ 51.40-20 *Check analysis*—(a) *General*. Analysis of two pipes from each lot of 400 lengths or fraction thereof of each size under 6 inches, from each lot of 200 lengths or fraction thereof of each size 6 to 20 inches, and from each lot of 100 lengths or fraction thereof of each size over 20 to 30 inches, may be made by the inspector from the finished pipe. By agreement between the manufacturer and the inspector, the analysis may be made on the skelp and the number shall be determined in the same manner as when taken from the finished pipe. Drillings for analysis shall be taken from several points around each pipe, or across each piece of skelp, selected for analysis. The chemical composition thus determined shall conform to the requirements specified in § 51.40-10.

(b) *Retests*. If the analysis of either length of pipe or length of skelp does not conform to the requirements specified in § 51.40-10, analysis of two additional lengths from the same lot shall be made, each of which shall conform to the requirements specified.

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

§ 51.40-25 *Tensile properties*. (a) The material shall conform to the following requirements as to tensile properties:

TABLE 51.40-25—PHYSICAL PROPERTIES

Physical requirements	Grade A	Grade B
Tensile strength, minimum, p. s. i.	48,000	60,000
Yield point, minimum, p. s. i.	30,000	35,000
Elongation in 2 inches, minimum, percent:		
Basic minimum elongation for walls $\frac{5}{16}$ inch and over in thickness, longitudinal strip tests, and for all small sizes tested in full section	35	30
For longitudinal strip tests, a deduction for each $\frac{1}{32}$ inch decrease in wall thickness below $\frac{5}{16}$ inch from the basic minimum elongation of the following percentage	1.75	1.50

¹ The following table gives the computed minimum values:

Wall thickness, inches	Elongation in 2 inches, minimum, percent	
	Grade A	Grade B
$\frac{5}{16}$ (0.312)	35.00	30.00
$\frac{9}{32}$ (.281)	33.25	28.50
$\frac{1}{4}$ (.250)	31.50	27.00
$\frac{5}{16}$ (.219)	29.75	25.50
$\frac{3}{16}$ (.188)	28.00	24.00
$\frac{1}{2}$ (.156)	26.25	22.50
$\frac{1}{8}$ (.125)	24.50	21.00
$\frac{3}{32}$ (.094)	22.75	19.50
$\frac{1}{16}$ (.062)	21.00	18.00

NOTE: The above table gives the computed minimum elongation values for each $\frac{1}{32}$ -inch decrease in wall thickness. Where the wall thickness lies between two values shown above, the minimum elongation value shall be determined by the following formulas:

Grade	Formula
A	$E = 56t + 17.50$
B	$E = 48t + 15.00$

where:
E=elongation in 2 inches in percent, and
t=actual thickness of specimen in inches.

(b) The yield point shall be determined by the drop of the beam or halt in the gauge of the testing machine, or other approved method.

(c) The test specimen taken across the weld shall show a tensile strength not less than the minimum tensile strength specified for the grade of pipe ordered. This test will not be required for pipe under 6 inches in outside diameter.

§ 51.40-30 *Flattening test*. Both crop ends from each length of pipe shall be flattened between parallel plates with the weld at the point of maximum bending until opposite walls of the pipe meet. No opening in the weld shall take place until the distance between the plates is less than two-thirds of the original outside diameter of the pipe. No cracks or breaks in the metal elsewhere than in the weld shall occur until the distance between the plates is less than one-third of the original outside diameter of the pipe, but in no case less than five times the thickness of the pipe wall. Evidence of lamination or burnt material shall not develop during the entire flattening process, and the weld shall not show injurious defects.

§ 51.40-35 *Hydrostatic test*. (a) Each length of pipe shall be tested at the mill to a hydrostatic pressure calculated from the following formula, provided that in

no case shall the test pressure exceed 2,500 p. s. i.:

$$P = \frac{2St}{D} \quad (1)$$

where:

P —minimum hydrostatic test pressure in pounds by square inch,

S —allowable fiber stress (16,000 to 18,000 p. s. i. for grade A and 20,000 to 22,000 p. s. i. for grade B, but in no case shall the stress produced exceed 80 percent of the specified yield point),

t —wall thicknesses in inches, and

D —outside diameter in inches.

(b) The hydrostatic pressure shall be maintained for not less than 5 seconds and while under test pressure, the pipe shall be jarred near both ends with a 2-pound hammer or its equivalent.

§ 51.40-40 *Test specimens.* (a) The longitudinal tension-test specimen shall be taken from the end of the pipe, or by agreement between the manufacturer and the inspector, may be taken from the skelp at a point approximately 90° from the weld, and shall not be flattened between gauge marks. The transverse tension-test specimen, if required by the inspector, shall be taken across the weld and from the same end of the pipe as the longitudinal test specimen. The sides of each specimen shall be parallel between gauge marks. When practicable to pull a test specimen in full thickness the standard 2-inch gauge length tension-test specimen shown in figure 51.04-35 (f) may be used.

(b) All specimens shall be tested at room temperature.

§ 51.40-45 *Number of tests.* (a) One longitudinal tension test shall be made on one length from each lot of 400 lengths or fraction thereof of each size under 6 inches and one longitudinal and, if required by the inspector, one transverse tension test on one length from each lot of 200 lengths or fraction thereof of each size 6 to 20 inches, and on one length from each lot of 100 lengths or fraction thereof of each size over 20 to 30 inches. When taken from the skelp the number of tests shall be determined in the same manner as when taken from the finished pipe.

(b) If any test specimen shows defective machining or develops flaws not associated with the welding, it may be discarded and another specimen substituted.

(c) If the percentage of elongation of any tension-test specimen is less than that specified in § 51.40-25 (a) and any part of the fracture is more than 3/4 inch from the center of the gauge length of a 2-inch specimen, as indicated by scribe scratches marked on the specimen before testing, the specimen may be discarded and another substituted.

(d) The flattening test specified in § 51.40-30 shall be made on both crop ends cut from each length of pipe.

(e) Each length of pipe shall be subjected to the hydrostatic test specified in § 51.40-35.

§ 51.40-50 *Retests.* (a) If the results of the tension tests of any lot do not conform to the requirements specified in § 51.40-25, retests of two additional lengths from the same lot shall be made,

each of which shall conform to the requirements specified.

(b) If any section fails when flattening tests are made on the crop ends of each length of pipe, other pieces from the length may be cut until satisfactory tests are obtained, otherwise the length shall be rejected. Precautions shall be taken so that crop ends may be identified with respect to the length from which they were cut.

§ 51.40-55 *Permissible variations in weights and dimensions.*—(a) *Weight.* The weight of any length of pipe shall not vary more than 3.5 percent under or 10 percent over that specified, but the carload weight shall be not more than 1.75 percent under the nominal weight.

(b) *Diameter.* The outside diameter shall not vary more than plus or minus 1 percent from the nominal size specified.

(c) *Thickness.* The minimum wall thickness at any point shall be not more than 12.5 percent under the nominal wall thickness specified in table 51.37-55 (a).

§ 51.40-60 *Lengths.* Unless otherwise specified, pipe shall be furnished in lengths averaging 38 feet or over, with a minimum length of 20 feet, but not more than 5 percent may be under 32 feet. Joints made by welding are permissible. When threaded pipe is ordered, joints shall be made by threading and shall not exceed 5 percent of the order.

§ 51.40-65 *Workmanship.*—(a) *Ends, plain end pipe.* Unless otherwise specified, plain end pipe for use with the Dresser or Dayton type coupling shall be reamed both outside and inside sufficiently to remove all burrs. Plain end pipe for welding shall be beveled on the outside to an angle of 35.0° with a tolerance of plus or minus 2.5° and with a width of flat at the end of the pipe of 1/16 plus or minus 1/32 inch. When material is ordered beveled to any other than a 35.0° angle it should be understood that the angle is to be measured from a line drawn perpendicular to the axis of the pipe. This means that a greater amount of material is removed with a 60° angle than with a 35° angle. Pipe shall be sufficiently free from indentations, projections, or roll marks for a distance of 8 inches from the end of the pipe to make a tight joint with the rubber gasket type of coupling. All plain end pipe intended for Dresser or Dayton type joints or for welding, sizes 10 3/4 inches and smaller in outside diameter, shall be not more than 1/32 inch smaller than the nominal outside diameter for a distance of 8 inches from the end of the pipe and shall permit the passing for a distance of 8 inches of a ring gauge which has a bore 1/16 inch larger than the nominal outside diameter of the pipe. Sizes larger than 10 3/4 inches in outside diameter shall be not more than 1/32 inch smaller than the nominal outside diameter for a distance of 8 inches from the end of the pipe and shall permit the passing for a distance of 8 inches of a ring gauge which has a bore 3/32 inch larger than the nominal outside diameter of the pipe.

(b) *Ends, threaded pipe.* Each end of threaded pipe shall be reamed to remove all burrs. All threads shall be in accordance with the American Standard for

Pipe Threads and cut so as to make a tight joint when the pipe is tested at the mill to the specified internal hydrostatic pressure. The variation from the standard, when tested with the standard working gauge, shall not exceed one and one-half turns either way. Pipe shall not be rounded-out by hammering in order to get a full thread. There shall be not more than two black threads for 3/4 inch taper among the perfect threads. Black threads should not be confused with imperfect threads, such as those torn, shaven, or broken.

(c) *Couplings.* Each length of threaded pipe shall be provided with one coupling, the thread of which shall be in accordance with the American Standard for Pipe Threads. Threads shall be cut so as to make a tight joint. Couplings may be of wrought iron or steel.

§ 51.40-70 *Finish.*—(a) *General.* The finished pipe shall be reasonably straight and free from injurious defects. Defects in excess of 12.5 percent of the nominal wall thickness shall be considered injurious.

(b) *Repair by welding.* Injurious defects in the pipe wall, provided their depth does not exceed one-third the specified wall thickness, shall be repaired by electric welding. Defects in the welds such as sweats or leaks, unless otherwise specified, shall be repaired or the piece rejected at the option of the manufacturer. Repairs of this nature shall be made by completely removing the defect, cleaning the cavity, and then electric welding.

(c) *Retest.* All repaired pipe shall be retested hydrostatically in accordance with § 51.40-35.

§ 51.40-75 *Marking.* Each length of pipe shall be legibly marked with appropriate symbols by stenciling, stamping, or rolling to show by whom manufactured, the grade of pipe, and that it conforms to this specification.

§ 51.40-80 *Protective coating.* After the pipe has been subjected to the hydrostatic test, and if required by the inspector, it shall be thoroughly cleaned of all dirt, oil, grease, loose scale, and rust; then dried, and given a protective coating of the kind and in the manner specified by the inspector.

§ 51.40-85 *Inspection.* The inspector shall have free entry, at all times while work is being performed, to all parts of the manufacturer's works that concern the manufacture of the material ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. All tests (except check analysis) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

§ 51.40-90 *Rejection.* Each length of pipe that develops injurious defects during shop working or application operations will be rejected, and the manufacturers shall be notified.

SUBPART 51.43—WELDED WROUGHT-IRON PIPE

NOTE: In substantial agreement with A. S. T. M. Designation: A 72-45.¹ Certified material—class B.

§ 51.43-1 *Scope*—(a) *General*. This specification covers "standard weight," "extra strong" and "double extra strong" welded wrought-iron pipe, both black and galvanized. Pipe ordered under this specification is intended for coiling, bending, flanging, and other special purposes. Butt-welded pipe is not intended for flanging and is not recommended for close bending or coiling in sizes 1½ inches and over.

(b) *Galvanized pipe*. When pipe ordered under this specification is to be galvanized, the tension, flattening, and bend tests shall be made on the base material before galvanizing, or the physical tests may be made on galvanized samples in which case any flaking or cracking of the zinc coating shall not be considered a cause for rejection. The zinc coating shall be tested in accordance with § 51.43-50 (d).

§ 51.43-5 *Process*. (a) The pipe shall be made from all pig-puddled or processed wrought iron² and shall be free from any admixture of iron scrap or steel.

NOTE: The term iron scrap applies only to foreign or bought scrap and does not include local mill products which are free from foreign or bought scrap. Any local mill products used shall be the equal of or a higher grade than the material specified.

(b) All pipe 2 inches and under in nominal diameter may be butt-welded, unless otherwise specified. All pipe over 2 inches in nominal diameter shall be lap-welded.

§ 51.43-10 *Chemical Composition*. The iron shall conform to the following requirement as to chemical composition: Manganese, maximum, percent..... 0.05

§ 51.43-15 *Tensile properties*. (a) The material shall have the following tensile properties:

TABLE 51.43-15 (a)—PHYSICAL PROPERTIES

Tensile strength, minimum, p. s. l.....	40,000
Yield point, minimum, p. s. l.....	24,000
Elongation in 8 inches, minimum:	
Full section.....	12
Strip test.....	9

(b) The yield point shall be determined by the drop of the beam or halt in the gauge of the testing machine. The speed of the crosshead of the machine shall not exceed ¼ inch per minute.

§ 51.43-20 *Fracture tests*. A section of pipe 6 inches in length shall be flattened until broken by repeated light blows of a hammer or by pressure; the fracture developed shall have a fibrous appearance.

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

² Wrought iron is defined as a ferrous material, aggregated from solidifying mass of pasty particles of highly refined metallic iron with which, without subsequent fusion, is incorporated a minutely and uniformly distributed quantity of slag.

§ 51.43-25 *Bend tests*. For pipe 2 inches or under in diameter, a sufficient length of coiling or bending pipe shall stand being bent cold through 90°, around a cylindrical mandrel the diameter of which is 15 times the nominal diameter of the pipe, without developing cracks at any portion and without opening the weld. Double extra strong pipe over 1½ inches in nominal size need not be subjected to the bend test.

§ 51.43-30 *Test specimens*. (a) Tension test specimens may be of full section or strips cut longitudinally from the pipe. The sides of specimens shall be parallel and not flattened between gauge marks.

(b) For pipe up to and including 2 inches in nominal size, tension test specimens shall be of the full section of the pipe. For pipe larger than 2 inches in nominal size, tension test specimens may be strips not less than ¾ inch in width, cut longitudinally from the pipe. The sides of such specimens shall be parallel and not flattened between gauge marks.

(c) Test specimens for determination

TABLE 51.43-40—HYDROSTATIC TEST PRESSURES¹ FOR WELDED WROUGHT-IRON PIPE
[Pressures expressed in pounds per square inch]

Size (nominal inside diameter), inches	"Standard weight" pipe		"Extra strong" pipe		"Double extra strong" pipe	
	Butt-welded	Lap-welded	Butt-welded	Lap-welded	Butt-welded	Lap-welded
¼ to 1, inclusive.....	700		850		1,000	
1¼ to 3, inclusive.....	1,800	1,000	1,100	1,500	1,200	1,800
3½ to 6, inclusive.....		1,200		1,700		2,000
8.....		1,200		1,700		2,800
10 to 12, inclusive.....		1,000		1,600		

¹ For pipe over 12 inches in nominal pipe size, the test pressure shall be calculated by the formula $P = \frac{2St}{D}$; where: P=pressure in pounds per square inch, S=fiber stress=60 percent of the specified yield point, t=thickness of wall in inches, and D=outside diameter in inches.

² Butt-welded pipe is not made in sizes larger than 2 inches nominal.

§ 51.43-45 *Permissible variations and dimensions*. (a) The weight of the pipe shall not vary from that prescribed in table 51.43-45 (a) by more than plus or minus 5 percent for standard weight and extra strong pipe nor more than plus or minus 10 percent for double extra strong pipe.

TABLE 51.43-45 (a)—STANDARD WEIGHTS AND DIMENSIONS OF WELDED WROUGHT-IRON PIPE¹

Size (nominal inside diameter) (inches)	Outside diameter (inches)	"Standard weight" pipe		"Extra strong" pipe		"Double extra strong" pipe ²	
		Number of threads per inch	Thickness (inches)	Thickness (inches)	Weight of pipe per linear foot, threaded and with couplings (pounds)	Thickness (inches)	Weight of pipe per linear foot, plain ends (pounds)
¼.....	0.405	27	0.070	0.25	0.098	0.31	
½.....	.540	18	.090	.43	.122	.54	
¾.....	.675	18	.093	.57	.129	.74	
1.....	.840	14	.111	.85	.151	1.09	0.307
1¼.....	1.050	14	.115	1.13	.157	1.47	.318
1½.....	1.315	11½	.136	1.68	.183	2.17	.369
2.....	1.660	11½	.143	2.28	.195	3.00	.393
2½.....	1.900	11½	.148	2.73	.204	3.63	.411
3.....	2.375	11½	.158	3.68	.223	5.02	.447
3½.....	2.875	8	.208	5.82	.282	7.66	.567
4.....	3.500	8	.221	7.62	.306	10.25	.615
5.....	4.000	8	.231	9.20	.325	12.51	.651
6.....	4.500	8	.242	10.89	.344	14.98	.690
8.....	5.563	8	.263	14.81	.383	20.78	.768
10.....	6.625	8	.286	19.10	.441	28.57	.884
12.....	8.625	8	.283	25.00			.895
14.....	8.625	8	.329	28.81	.510	43.39	
16.....	10.750	8	.284	32.00			
18.....	10.750	8	.313	35.60			
20.....	10.750	8	.372	41.13	.510	54.74	
24.....	12.750	8	.336	45.00			
30.....	12.750	8	.382	50.71	.510	65.42	

¹ Weights prescribed in this table are for pipe 12 inches and under in nominal inside diameter, with threaded ends and couplings; sizes larger than those shown in the table are measured by the outside diameter and will be furnished with plain ends unless otherwise specified; for such sizes it will be necessary to accept manufacturers' weights or calculate the weights on the basis of one cubic inch of wrought iron weighing 0.2767 pound.

² The American standard for wrought-iron and wrought-steel pipe (ASA No.: B36.10-1939) has assigned no schedule number to "double extra strong" pipe.

³ Unless specifically stated on the order the lighter weights will not be furnished.

of weight of coating shall be cut approximately 4 inches in length from opposite ends of the lengths of pipe selected for testing.

(d) All specimens shall be tested at room temperature.

§ 51.43-35 *Number of tests*. (a) One of each of the tests specified in §§ 51.43-15, 51.43-20, and 51.43-25 may be made on a length in each lot of 500 lengths or fraction thereof, of each size.

(b) Two test specimens for the determination of weight of coating shall be taken, one from each end of one length of galvanized pipe, selected at random from each lot of 500 lengths or fraction thereof, of each size.

(c) Each length shall be subjected to the hydrostatic test specified in § 51.43-40.

§ 51.43-40 *Hydrostatic tests*. Each length of pipe shall be tested at the mill to a hydrostatic test pressure specified in table 51.43-40. Pipe 2 inches and larger in diameter shall be jarred near one end while under test pressure.

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(b) For pipe 1½ inches or under in nominal size, the outside diameter at any point shall not be more than ¼ inch over nor more than ½ inch under the standard outside diameter. For pipe 2 inches or over in nominal size, the outside diameter shall not be more than plus or minus 1 percent from the standard specified.

(c) Unless otherwise specified, pipe shall conform to the following regular practice:

(1) Standard weight pipe shall be in random lengths from 16 to 22 feet, but not more than 5 percent of the total number of lengths may be jointers, which are two pieces coupled together. When ordered with plain ends 5 percent may be in lengths of 12 to 16 feet.

(2) Extra strong and double extra strong pipe shall be in random lengths of 12 to 22 feet and 5 percent may be in lengths of 6 to 12 feet.

(3) Each end of standard weight pipe shall be threaded. Extra strong and double extra strong pipe shall be furnished with plain ends.

(4) All threads shall be in accordance with the American Standard for Pipe Threads, cut so as to make a tight joint when the pipe is tested at the mill to the specified internal hydrostatic pressure.

(d) Nipples shall be cut from pipe of the same weight and quality described in this specification.

§ 51.43-50 *Galvanized pipe.* (a) Galvanized pipe shall be coated with zinc inside and outside by the hot-dip process.

(b) The zinc used for the coating shall be any grade of zinc conforming to the Standard Specifications for Slab Zinc (Spelter) (A. S. T. M. Designation: B 6).

(c) The weight of zinc coating shall be not less than 2.0 ounces per square foot of total coated surface, as determined in the manner prescribed in paragraph (d). The weight of coating expressed in ounces per square foot shall be calculated by dividing the total weight of zinc, inside plus outside, by the total area, inside plus outside, of the surface coated.

(d) The weight of zinc coating shall be determined by a stripping test made in accordance with the Standard Methods of Test for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles (A. S. T. M. Designation: A 90). The total zinc on each specimen shall be determined in a single stripping operation and the average of the results from the two specimens from each pipe shall be the weight of zinc coating.

§ 51.43-55 *Finish.* The finished pipe shall be reasonably straight and free from injurious defects. All burrs at the ends of the pipe shall be removed.

SUBPART 51.46—STEEL FORGINGS

NOTE: In substantial agreement with A. S. T. M. Designations: A 105-46, A 181-46, and A 182-46.¹ Certified material—class B.

§ 51.46-1 *Scope.* (a) This specification covers forged or rolled carbon and alloy steel pipe flanges, forged fittings, and valves and parts intended for general service and high-temperature service. The term, "forgings" used in this specification shall be understood to cover one or all of the products mentioned above, either forged or rolled.

(b) Four grades of carbon-steel material are covered, designated grade A, B, C, or D; and 10 grades of alloy steel are covered, including 7 ferritic steels and 3 austenitic steels, designated F1, F3, F4, F5, F6, F7, F11, F8, F10 or F12. All grades are classified in accordance with their chemical and physical properties as specified in §§ 51.46-25 and 51.46-30 (a).

(c) Grades A, B, C, and D are suitable for use in connection with temperatures up to and including 850° F. Grades C or D are intended for general service and for pressure ratings not exceeding 300 p. s. i. standard fittings. Alloy steel grades are suitable for use in connection with temperatures up to and including 1,000° F.

§ 51.46-5 *Process.* The steels may be made by the electric-furnace, open-hearth, or other process accepted by the Commandant.

§ 51.46-10 *Discard.* A sufficient discard shall be made from each ingot to secure freedom from injurious piping and undue segregation. In the case of alloy steel, it shall have a homogeneous structure as shown by the macro-etch test in § 51.46-55.

§ 51.46-15 *Manufacturing practice.* (a) Material for forgings shall consist of blooms, billets, slabs, or bars either forged or rolled from an ingot, and cut to the required length by a process that will not produce injurious defects in the forging.

(b) The material shall be forged by hammering, pressing, rolling, extruding, or upsetting, and shall be brought as nearly as practicable to the finished shape and size by hot working and shall be so processed as to cause metal flow during the hot-working operation in the direction most favorable for resisting the stresses encountered in service.

(c) Flanges shall be protected against sudden or too rapid cooling from the rolling or forging while passing through the critical range.

§ 51.46-20 *Heat treatment.* (a) All forgings with the exception of grades C and D shall receive a heat treatment proper to their design and chemical composition.

(b) Heat treatment shall be performed before machining except in instances where reheat-treating is necessary.

(c) Grade A or B carbon steels may be annealed or normalized.

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

(d) The alloy steels may be full annealed; normalized; full annealed and normalized; or full annealed or normalized, or both, followed by tempering.

(e) No forgings that have been quenched in any liquid medium shall be offered under this specification, except that liquid quenching shall be permitted for austenitic alloy steels only.

(f) The austenitic steels grades F8, F10, and F12 shall receive a stabilizing treatment as described in paragraph (j).

(g) The procedure for full annealing shall consist in allowing the forgings, immediately after forging or rolling, to cool to a temperature below the critical range, under suitable conditions to prevent injuries by too rapid cooling. They shall then be uniformly reheated to the proper temperature and for the required time to refine the grain (a group thus reheated being known as an "annealing charge") and cooled slowly thereafter in the furnace or in lime. The forgings shall not be removed from the furnace or the lime until a metal temperature of approximately 500° F. has been attained.

(h) The procedure for normalizing shall consist in allowing the forgings, immediately after forging or rolling, to cool to a temperature below the critical range, under suitable conditions to prevent injuries by too rapid cooling. They shall then be uniformly reheated to the proper temperature and held there a sufficient time to refine the grain (a group thus reheated being known as a "normalizing charge"), followed by cooling in still air at room temperature.

(i) The procedure for tempering shall consist in reheating the forgings to a temperature at least 100° F. above the temperature to be encountered in service, but in no case shall the tempering temperature be lower than 850° F. The material shall be held at the required temperature for not less than 1 hour per inch of thickness at the thickest section, followed by cooling in the furnace or in still air. In case of grade F6, the minimum tempering temperature shall be 1,150° F.

(j) The procedure for stabilizing austenitic steels shall consist in holding the forgings for sufficient time at the stabilizing temperature, followed by rapid air cooling, or by quenching in a liquid medium if required, to meet the physical properties specified.

§ 51.46-25 *Chemical composition.* The steel shall conform to the following requirements as to chemical composition:

TABLE 51.46-25—CHEMICAL COMPOSITION
CARBON-STEEL GRADES

Chemical elements	Grades A and B	Grade C	Grade D
	Percent	Percent	Percent
Carbon, maximum.....	(1)	1.05	(1)
Manganese, maximum.....	0.90	0.90	0.90
Phosphorus, maximum.....	.05	.05	.05
Sulfur, maximum.....	.05	.05	.05
Silicon, maximum.....	(1)	(1)	(1)

¹ When flanges will be subject to arc or gas welding, the carbon content shall not exceed 0.35 percent. When the carbon is restricted to 0.35 percent, maximum, it may be necessary to add silicon to the composition for grade B or D and for the heavier thicknesses of grade A or C flanges in order to meet the required tensile properties. The silicon content shall not exceed 0.30 percent.

² The phosphorus and sulfur content may each be 0.055 percent in determining chemical composition by check analysis.

TABLE 51.46-25.—CHEMICAL COMPOSITION—Continued
ALLOY-STEEL GRADES

Type	Ferritic steels						
Identification symbol	F1	F3	F4	F5	F6	F7	F11
Grade	Carbon-molybdenum	Chromium-molybdenum	Nickel-chromium-molybdenum	4 to 6 percent chromium	13 percent chromium	Chromium-molybdenum	Chromium-manganese-molybdenum
Carbon, percent	0.35 maximum	0.15 to 0.25	0.35 to 0.45	0.25 maximum	0.12 maximum	0.25 to 0.35	0.25 to 0.40
Manganese, do	0.30 to 0.80	0.40 to 0.60	0.50 to 0.80	0.30 to 0.50	0.50 maximum	0.40 to 0.60	1.20 to 1.50
Phosphorus, maximum, do	0.04	0.04	0.04	0.03	0.03	0.04	0.04
Sulfur, maximum, do	0.05	0.05	0.05	0.03	0.03	0.05	0.05
Silicon, do	0.20 to 0.50	0.45 to 0.75		0.50 maximum	0.50 maximum	0.15 to 0.45	0.40 to 0.60
Nickel, do			1.50 to 2.00		0.50 maximum		
Chromium, do		1.50 to 2.00	0.50 to 0.80	4.00 to 6.00	11.5 to 13.5	0.80 to 1.10	0.60 to 0.90
Molybdenum, do	0.40 to 0.60	0.60 to 0.80	0.30 to 0.40	² 0.45 to 0.65		0.15 to 0.25	0.25 to 0.40
Tungsten, do				³ 0.75 to 1.25			
Titanium, do				⁴ 1.00 maximum			
Columbium, do							

Type	Austenitic steels					
Identification symbol	F8	F8m	F8c	F8t	F10	F12
Grade	18 chromium 8 nickel	18 chromium 8 nickel modified, with molybdenum	18 chromium 8 nickel modified, with columbium	18 chromium 8 nickel modified, with titanium	20 nickel 8 chromium	20 nickel 8 chromium
Carbon, percent	0.08 maximum	0.08 maximum	0.08 maximum	0.08 maximum	0.10 to 0.20	0.45 maximum
Manganese, do	2.50 maximum	2.50 maximum	2.50 maximum	2.50 maximum	0.50 to 0.70	0.50 to 0.70
Phosphorus, maximum, do	0.035	0.035	0.035	0.035	0.03	0.03
Sulfur, maximum, do	0.030	0.030	0.030	0.030	0.03	0.03
Silicon, do	0.85 maximum	0.85 maximum	0.85 maximum	0.85 maximum	1.00 to 1.40	0.90 to 1.25
Nickel, do	8.00 minimum	10.00 minimum	9.50 minimum	9.00 minimum	19.0 to 22.0	19.0 to 22.0
Chromium, do	18.00 minimum	17.00 minimum	17.00 minimum	17.00 minimum	7.00 to 9.00	7.00 to 9.00
Molybdenum, do		2.00 minimum				
Tungsten, do				(⁵)		
Titanium, do			(¹)			
Columbium, do						

¹ Either molybdenum or tungsten shall be used.² May be added.³ Grade F8c shall have a columbium content of not less than ten times the carbon content and not more than 1 percent.⁴ Grade F8t shall have a titanium content of not less than five times the carbon content and not more than 0.60 percent.

§ 51.46-30 *Tensile properties.* (a) The material shall conform to the following requirements as to tensile properties:

TABLE 51.46-30 (a)—PHYSICAL PROPERTIES

Grade	Tensile strength, minimum (p. s. i.)	Yield point, minimum (p. s. i.)	Elongation in 2 inches, minimum (percent)	Reduction of area, minimum (percent)
A.....	60,000	30,000	25	38
B.....	70,000	36,000	22	30
C.....	60,000	30,000	22	35
D.....	70,000	36,000	18	24
F1.....	70,000	45,000	25	35
F3.....	70,000	40,000	20	40
F4.....	90,000	70,000	18	50
F5.....	90,000	65,000	22	50
F6.....	85,000	55,000	25	60
F7.....	100,000	75,000	18	50
F11.....	100,000	70,000	17	50
F8.....	75,000	30,000	45	60
F10.....	80,000	35,000	40	60
F12.....	100,000	45,000	50	60

(b) The yield point shall be determined by the drop of the beam or halt in the gauge of the testing machine, or by the use of dividers at a crosshead speed not to exceed $\frac{1}{8}$ inch per minute. Where a definite yield point is not exhibited, the yield strength corresponding to a limiting permanent offset of 0.2 percent of the gauge length of the specimen shall be used instead. The tensile strength shall be determined at a speed of not to exceed $1\frac{1}{2}$ inches per minute.

(c) The yield strength, where given shall be determined by an extensometer reading to 0.0002 inch. The extensometer shall be attached to the specimen at the gauge marks and not to the shoulders of the specimen nor to any part of the testing machine.

§ 51.46-35 *Hydrostatic tests.* Valve bodies or fittings and other pressure containing parts shall be tested after machining to the hydrostatic test pressures specified in tables 55.07-15 (e10) and 55.07-15 (e11).

§ 51.46-40 *Test specimens.* (a) The tension-test specimens taken from the forgings, billets, or bars shall be machined to the form and dimensions shown in figure 51.04-35 (f), except as specified in paragraph (b).

(b) In the case of small sections which will not permit of taking the standard test specimen specified in paragraph (a), the tension test specimen shall be as large as feasible and its dimensions shall be proportional to those shown in figure 51.04-35 (f). The gauge length for measuring elongation shall be four times the diameter of the specimen.

(c) For purposes of tests, the necessary extra forgings or test bars shall be provided. The test specimen if cut from a flange shall be cut tangentially from the flange portion approximately midway between the inner and outer surfaces and approximately midway between the front and back faces. When it is impracticable to provide extra forgings for test purposes, test bars may be made from the billet or bar, provided they are given approximately the same reduction and heat treatment as the forgings.

§ 51.46-45 *Number of tests.* (a) One tension test at room temperature shall be made from each melt in each heat-treatment charge.

(b) If any test specimen shows defective machining, it may be discarded and another specimen substituted from the same melt and heat-treatment charge.

(c) If the percentage of elongation of any tension test specimen is less than that prescribed in § 51.46-30 (a) and any part of the fracture is more than $\frac{3}{4}$ inch from the center of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

§ 51.46-50 *Retests.* If any of the results of the physical tests of any test lot do not conform to the requirements specified, the manufacturer may re-treat such lots but not more than twice and retests shall be made as in § 51.46-45 (a).

§ 51.46-55 *Macro-etch tests.* In case of question as to the soundness of material in any lot of forgings and its suitability for the intended service, a macro-etching test shall be made for each melt present in the lot. Etching tests shall show sound and reasonably uniform material, free from injurious laminations, cracks, segregations, and similar objectionable defects. If on successive tests 10 percent of any melt fail to pass the requirements of the macro-etch test, all forgings from that melt shall be rejected.

§ 51.46-60 *Workmanship and finish.* (a) The forgings shall conform to the sizes and shapes specified.

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(b) They shall be free from injurious defects and shall have a workmanlike finish.

§ 51.46-65 *Marking.* Identification marks consisting of the manufacturer's name or trade mark, primary service pressure rating, grade of material¹ and size shall be legibly stamped on each forging, and in such position as not to injure the usefulness of the forging.

SUBPART 51.49—ALLOY-STEEL BOLTING MATERIAL

NOTE: In substantial agreement with A. S. T. M. Designation: A 193-46T.² Certified material—class B.

§ 51.49-1 *Scope.* (a) This specification covers alloy-steel bolting material for pressure vessels, valves, flanges, and fittings for high-temperature service to 1,000° F. The term, "bolting material" as used in this specification covers rolled, forged, or cold-drawn bars, and bolts, screws, studs, and stud bolts.

(b) Fifteen grades are covered, including 13 ferritic steels designated grades BA, BB, BC, B4, B5, B6, B7, B7a, B11, B12, B13, B14, and B15, and two austenitic steels designated grades B8 and B8F. Selection shall depend upon design, service conditions, physical properties, and high-temperature characteristics. Other grades of material may be employed provided they conform to the requirements of this specification.

(c) To meet the requirements of grades BA, BB and BC, the following types of alloy-steel may be submitted: nickel, chromium-nickel, chromium-vanadium, chromium-manganese, nickel-chromium-molybdenum, or any other types approved by the Commandant.

(d) Nuts and washers for use with this bolting material are covered in § 51.49-50.

§ 51.49-5 *Process.* The steel shall be made by one or more of the following processes: open-hearth, electric-furnace, or crucible.

§ 51.49-10 *Discard.* A sufficient discard shall be made from each ingot to secure freedom from injurious piping and undue segregation.

§ 51.49-15 *Heat treatment.* (a) Ferritic steels shall be properly heat-treated as best suits the characteristics of each grade. Immediately after rolling or forging, the bolting material shall be allowed to cool to a temperature below the cooling critical range. The materials which are to be furnished in the liquid-quenched condition shall then be uniformly reheated to the proper tem-

perature to refine the grain (a group thus reheated being known as a "quenching charge") and quenched in some liquid medium under substantially uniform conditions for each quenching charge. The materials which are to be furnished in the normalized or air-quenched condition shall be reheated to the proper temperature to refine the grain and cooled uniformly in air to a temperature below the cooling critical range. The material, whether liquid quenched or normalized, shall then be uniformly reheated or "drawn" at a temperature at least 100° F. higher than the proposed

operating temperature to which the material will be subjected in service.

(b) For austenitic steels, heat treatment shall consist of allowing the material immediately after rolling or forging to cool at a rate sufficiently rapid to prevent injury to the material; reheating to the proper temperature and holding at that temperature for a sufficient time, followed by rapid air cooling or by quenching in a liquid medium.

§ 51.49-20 *Chemical composition.* Each alloy shall conform to the requirements as to chemical composition prescribed in the following table:

TABLE 51.49-20—CHEMICAL COMPOSITION

Type.....	Ferritic steels					
Identification symbol.....	BA		BB		BC	
Chemical elements	Range	Check variation, over ¹	Range	Check variation, over ¹	Range	Check variation, over ¹
Phosphorus, maximum.....	Percent 0.04	Percent 0.005	Percent 0.04	Percent 0.005	Percent 0.04	Percent 0.005
Sulfur, maximum.....	.04	.005	.04	.005	.04	.005
Type.....	Ferritic steels					
Identification symbol.....	B4		B5		B6	
Grade.....	Nickel-chromium-molybdenum		5 percent chromium (A. I. S. I. type 501 modified)		12 percent chromium (A. I. S. I. type 416)	
Chemical elements	Range	Check variation, over or under ¹	Range	Check variation, over or under ¹	Range	Check variation, over or under ¹
Carbon.....	0.38 to 0.45	0.02	0.30 to 0.30	0.02	0.15 max.	0.01 over
Manganese.....	.55 to .75	.03	.30 to .60	.03	1.25 max.	.04 over
Phosphorus, maximum.....	.04	.005 over	.04	.005 over	.14	(²)
Sulfur, maximum.....	.04	.005 over	.03	.005 over	1.50	(²)
Silicon.....	.20 to .35	.02	.30 to .60	.05	.30 to .60	.05
Nickel.....	1.60 to 1.95	.05				
Chromium.....	.55 to .75	.03	4.00 to 6.00	.10	12.00 to 14.00	.15
Molybdenum.....	.30 to .40	.02	.45 to .65	.05	(³)	.03 over
Tungsten.....						
Vanadium.....						
Selenium.....						
Zirconium.....					0.50 max. (⁴)	.03 over
Type.....	Ferritic steels					
Identification symbol.....	B7		B7a		B11	
Grade.....	Chromium-molybdenum (A. I. S. I. 4140 or 4142)		Chromium-high molybdenum		Tungsten-chromium vanadium	
Chemical elements	Range	Check variation, over or under ¹	Range	Check variation, over or under ¹	Range	Check variation, over or under ¹
Carbon.....	0.38 to 0.45	0.02	0.38 to 0.45	0.02	0.41 to 0.48	0.02
Manganese.....	.75 to 1.00	.04	.75 to 1.00	.04	.25 to .40	.03
Phosphorus, maximum.....	.04	.005 over	.04	.005 over	.04	.005 over
Sulfur, maximum.....	.04	.005 over	.04	.005 over	.04	.005 over
Silicon.....	.20 to .35	.02	.20 to .35	.02	.20 to .35	.02
Nickel.....						
Chromium.....	.80 to 1.10	.05	.80 to 1.10	.05	1.00 to 1.50	.05
Molybdenum.....	.15 to .25	.02	.50 to .70	.05		
Tungsten.....					1.70 to 2.30	.10
Vanadium.....					.20 to .30	.03
Selenium.....						
Zirconium.....						

¹ Unless otherwise specified, separate determinations may vary from the specified ranges, except that elements in any melt must not vary both above and below the specified range.

² If sulfur is added for machinability, phosphorus shall not exceed 0.04 percent.

³ Phosphorus and/or sulfur and/or selenium shall total not less than 0.07 percent.

⁴ Sulfurized or phosphorized steels are not subject to check analysis, unless misapplication is clearly indicated.

⁵ Either element shall be used as specified.

¹ A. S. T. M. grade designations I and II of A 105 and A 181 may be used as alternate markings for grades A, B, C, and D.

² A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

§ 51.49-25 *Tensile properties.* (a) The material shall conform to the requirements as to tensile properties prescribed in the following table at room temperature after heat treatment:

TABLE 51.49-25 (a)—PHYSICAL PROPERTIES

(Physical properties given in italics represent the standard heat treatment to be given material stocked for use under the specification as agreed by manufacturers)

FERRITIC STEELS

Grade	Diameter, inches	Minimum tensile strength, min., p. s. i.	Tensile strength, min., p. s. i.	Yield point, min., p. s. i.	Elongation in 2 inches, minimum, percent	Reduction of area, minimum, percent
B.A.	2½ and under	1200	96,000	70,000	20	50
	Over 2½ to 4, inclusive	1200	96,000	68,000	20	50
B.B.	2½ and under	1100	100,000	75,000	20	50
	Over 2½ to 4, inclusive	1100	100,000	73,000	20	50
B.C.	2½ and under	1000	105,000	80,000	16	48
	Over 2½ to 4, inclusive	1000	105,000	78,000	16	48
B.4—nickel-chromium-molybdenum	2½ and under	1100	105,000	80,000	14	45
	Over 2½ to 4, inclusive	1100	105,000	78,000	14	45
B.5—4 to 6 percent chromium	2½ and under	1200	120,000	100,000	15	50
	Over 2½ to 4, inclusive	1200	120,000	98,000	15	50
B.6—13 percent chromium	2½ and under	1200	120,000	100,000	15	50
	Over 2½ to 4, inclusive	1200	120,000	98,000	15	50
B.7—chromium-molybdenum	2½ and under	1200	120,000	100,000	15	50
	Over 2½ to 4, inclusive	1200	120,000	98,000	15	50
B.7a—chromium-high-molybdenum	2½ and under	1200	120,000	100,000	15	50
	Over 2½ to 4, inclusive	1200	120,000	98,000	15	50
B.11—tungsten-chromium-vanadium	2½ and under	1200	120,000	100,000	15	50
	Over 2½ to 4, inclusive	1200	120,000	98,000	15	50
B.12—Nickel-chromium	2½ and under	1200	120,000	100,000	15	50
	Over 2½ to 4, inclusive	1200	120,000	98,000	15	50
B.13—tungsten-molybdenum-chromium	2½ and under	1200	120,000	100,000	15	50
	Over 2½ to 4, inclusive	1200	120,000	98,000	15	50
B.14—chromium-molybdenum-vanadium	2½ and under	1200	120,000	100,000	15	50
	Over 2½ to 4, inclusive	1200	120,000	98,000	15	50
B.15—silicon-chromium-molybdenum	2½ and under	1200	120,000	100,000	15	50
	Over 2½ to 4, inclusive	1200	120,000	98,000	15	50

1 Special normalizing treatment required.

TABLE 51.49-20—CHEMICAL COMPOSITION—Continued

Type	Ferritic steels				Type	Austenitic steels			
	B.12	B.13	B.14			B.8	B.8F		
Identification symbol	Nickel-chromium (A. I. S. I. 3140)	Tungsten-molybdenum-chromium	Chromium-molybdenum-vanadium		Identification symbol	Silicon-chromium-molybdenum	Free machining 18 chromium 8 nickel (A. I. S. I. type 303)		
Chemical elements	Range	Check variation, over or under 1	Range	Check variation, over or under 1	Chemical elements	Range	Check variation, over or under 1	Range	Check variation, over or under 1
Carbon	0.38 to 0.45	0.02	0.38 to 0.45	0.02	Carbon	0.41 to 0.48	0.01 over	0.08 max.	0.01 over
Manganese	.70 to .90	.03	.75 to 1.00	.04	Manganese	.45 to .65	.04 over	2.00 max.	.04 over
Phosphorus, maximum	.04	.005 over	.04	.005 over	Phosphorus, maximum	.04	.005 over	.14	.04 over
Sulfur, maximum	.035	.005 over	.04	.005 over	Sulfur, maximum	.04	.005 over	.50	.05 over
Silicon	.20 to .35	.02	.20 to .35	.02	Silicon	.20 to .35	.05 over	1.00 max.	.05 over
Nickel	.90 to 1.40	.05	.80 to 1.10	.05	Nickel	.80 to 1.10	.15	8.00 to 10.00	.10
Chromium	1.15 to 1.75	.03	.30 to .40	.02	Chromium	.30 to .40	.20	17.00 to 19.00	.20
Molybdenum			.20 to .30	.03	Molybdenum				
Tungsten					Tungsten				
Vanadium					Vanadium				
					Titanium				
					Columbium				
					Zirconium				

1 Unless otherwise specified, separate determinations may vary from the specified ranges, except that elements in any melt must not vary both above and below the specified range.

2 If sulfur is added for machinability, phosphorus shall not exceed 0.04 percent.

3 Phosphorus and/or sulfur and/or selenium shall total not less than 0.07 percent.

4 Sulfurized or phosphorized steels are not subject to check analysis, unless misapplication is clearly indicated.

5 Either element shall be used as specified.

6 Molybdenum, plus zirconium, shall not exceed 0.60 percent.

7 Not recommended for temperatures over 800° F.

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TABLE 51.49-25 (a)—PHYSICAL PROPERTIES—Continued
AUSTENITIC STEELS

Grade	Diameter, inches	Minimum tempering temperature, °F.	Tensile strength, minimum, p. s. i.	Yield point, minimum, p. s. i.	Elongation in 2 inches, minimum, percent	Reduction of area, minimum, percent
B8—and B8F—18 chromium-8 nickel regular and free machining.	All diameters.....	2 2000	75,000	30,000	35	50

² Water quench.

(b) The yield point shall be determined by the drop of the beam or halt in the gauge of the testing machine, or by the use of dividers or other approved method, at a crosshead speed not to exceed 1/8 inch per minute. Where a definite yield point is not exhibited, the yield strength corresponding to a limiting permanent offset of 0.2 percent of the gauge length of the specimen, shall be used instead. The "offset method" of determining yield strength as described in the Standard Methods of Tension Testing of Metallic Materials (A. S. T. M. Designation: E 8) of the American Society for Testing Materials shall be followed. The tensile strength shall be determined at a speed of head not to exceed 1 1/2 inches per minute.

§ 51.49-30 *Test specimens.* (a) The tension-test specimens taken from the bolting material shall be machined to the form and dimensions as shown in figure 51.04-35 (f) except as specified in paragraph (b).

(b) In the case of small sections which will not permit taking of the standard tension-test specimen required in paragraph (a), the tension-test specimen shall be as large as possible and its dimensions shall be proportional to those shown in figure 51.04-35 (f). The gauge length for measuring the elongation shall be four times the diameter of the specimen.

(c) Specimens for tension tests shall be taken longitudinally. For sizes under 1 1/2 inches in diameter the full section shall be turned to conform to the requirements specified in paragraph (a). For sizes 1 1/2 inches in diameter and larger the specimen shall be taken half-way between the center and the surface.

§ 51.49-35 *Number of tests.* (a) For bars, one tension test shall be made from each tempering charge. If more than one heat-treatment charge is represented in a tempering charge, one tension test shall be made from each heat-treatment charge. If more than one melt is represented in a heat-treatment charge, one tension test shall be made from each melt.

(b) One tension test shall be made for each lot of 300 pieces or fraction thereof of bolts, screws, studs, and stud bolts for sizes 2 1/2 inches and under in diameter; or for each lot of 100 pieces or fraction thereof for sizes over 2 1/2 inches.

(c) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(d) If the percentage of elongation of any tension-test specimen is less than that prescribed in § 51.49-25 and any part of the fracture is more than 3/4 inch

from the center of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

§ 51.49-40 *Retests.* If the results of the physical tests of any test lot do not conform to the requirements specified, the manufacturer may re-treat such lot not more than twice, in which case two additional tension tests shall be made from such lot, all of which shall conform to the requirements specified.

§ 51.49-45 *Finish.* (a) Bolts, screws, studs, and stud bolts shall be pointed and shall have a workmanlike finish.

(b) Headed bolts shall be semifinished, hexagonal in shape, and in accordance with the dimensions for the regular or heavy series, as required, of the American Standard for Wrench-Head Bolts and Nuts and Wrench Openings (ASA No.: B 18.2-1941). Unless otherwise specified, the American Standard heavy hexagon series shall be used.

§ 51.49-50 *Nuts and washers.* Bolts, studs, and stud bolts shall be equipped with nuts conforming to subpart 51.55. If washers are used under nuts they shall be of forged or rolled steel. All washers shall be free from injurious defects and shall have a workmanlike finish.

§ 51.49-55 *Threads.* Alloy-steel bolts, stud bolts, and nuts, unless otherwise specified, shall be threaded in accordance with the American Standard for Screw Threads for High Strength Bolting (ASA No.: B 1.4-1945), sizes 1 inch and smaller in diameter with the coarse thread series, and 1 1/4 inches and larger in diameter with the 8-pitch thread series.

§ 51.49-60 *Marking.* The serial marking for identification of material and the manufacturer's identification mark shall be stamped on the top of the head of bolts and screws, and on one end of studs, and stud bolts.

SUBPART 51.52—CARBON-STEEL BOLTING MATERIAL

NOTE: In substantial agreement with A. S. T. M. Designation: A 107-46, and MSS Specification No. SP-39-1945.¹ Certified material—class B.

§ 51.52-1 *Scope.* This specification covers carbon-steel bolting and nut material for pressure vessels, valves, flanges, and fittings for low temperature, not exceeding 450° F. The bolting mate-

¹ Copies of these A. S. T. M. and MSS specifications have been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

rial shall be an open-hearth free-cutting steel. The nut material shall be of sulfurized nut stock, either bessemer or open-hearth steel.

§ 51.52-5 *Process.* (a) The steel for bolting material shall be made by the open-hearth or electric-furnace process.

(b) The steel for the nut material shall be made by the open-hearth, electric-furnace or bessemer process.

§ 51.52-10 *Manufacture.* (a) Bolt heads shall be formed by hot-working or cold-working.

(b) Nuts shall be made by the hot-process or cold-process, except that sizes 1/2 inch and smaller machined from bar stock may be furnished.

(c) Bolt threads shall be cut or rolled. In no case shall the diameter of the unthreaded portion of the shank be less than the minimum pitch diameter of the thread.

§ 51.52-15 *Stress relieving.* When heads and nuts are cold-formed, the material shall be heat-treated after the last cold-forming operation to at least 900° F. and allowed to cool uniformly in still air.

§ 51.52-20 *Chemical composition.* The steel for the bolts and nuts shall conform to the following requirements as to chemical composition:

TABLE 51.52-20—CHEMICAL COMPOSITION

Chemical elements	Bolts	Nuts
	Percent	Percent
Carbon.....	0.18 to 0.23	0.18 to 0.25
Manganese.....	.70 to 1.00	0.40 to 1.00
Phosphorus, maximum.....	.045	.12
Sulfur.....	.08 to .13	.075 to .15

¹ Maximum.

§ 51.52-25 *Tensile properties.* The material for bolts shall conform to the following requirements as to tensile properties:

Tensile strength, p. s. i.----- 60,000 to 90,000
Minimum yield point, p. s. i.----- 36,000

§ 51.52-30 *Bend test.* The unthreaded portion of the bolt shall not crack on the outside of the bent portion, when bent cold through 180° about a radius equal to the diameter of the bolt.

§ 51.52-35 *Stripping test.* Nuts shall have sufficient strength to stress a bolt to the maximum tensile strength specified in § 51.52-25 without nut threads stripping.

§ 51.52-40 *Brinell hardness test.* Finished nuts shall have a minimum Brinell hardness of 120.

§ 51.52-45 *Test specimens.* (a) The tension test shall be made on a finished bolt, with the load applied between the head and a nut screwed on to full thread engagement.

(b) If the diameter and length of the bolt will not permit the test specified in paragraph (a), the shank of the bolt shall be turned to a suitable gauge size, and the specimen thus tested shall have a tensile strength of not less than 55,000 p. s. i.

§ 51.52-50 *Number of tests.* (a) One tension and one bend test shall be made for each lot of 2,000 pieces or fraction

thereof for sizes 1 inch and under in diameter; and for each lot of 1,000 pieces or fraction thereof for sizes over 1 inch in diameter.

(b) If any test specimen shows defective machining or develops flaws it may be discarded and another specimen substituted.

(c) The stripping and hardness tests may be made on nuts selected as follows: two nuts per keg for sizes $\frac{5}{8}$ inch and smaller; one nut per keg for sizes over $\frac{5}{8}$ inch, up to and including $1\frac{1}{2}$ inches; and one nut per two kegs for sizes larger than $1\frac{1}{2}$ inches.

§ 51.52-55 *Retests.* If the results of tests of any test lot do not conform to the requirements specified, two additional tests from the same lot shall be made, each of which shall conform to the requirements specified.

§ 51.52-60 *Workmanship and finish.* (a) The bolts and nuts shall be free from injurious defects and shall have a workmanlike finish. The screw end of the bolt shall be convex or beveled.

(b) Nuts shall be unfinished or semi-finished as required, hexagonal in shape, and in accordance with dimensions for the heavy series of the American Standard for Wrench-Head Bolts and Nuts and Wrench Openings (ASA No.: B 18.2-1941). Unless otherwise specified, semi-finished nuts shall be furnished.

(c) Bolts shall have regular unfinished square head or heavy unfinished hexagon heads as required and the dimensions of heads shall conform to the American Standard for Wrench-Head Bolts and Nuts and Wrench Openings (ASA No.: B 18.2-1941). Unless otherwise specified, bolts having American Standard regular unfinished square heads shall be furnished.

(d) All bolts and nuts, unless otherwise specified, shall be threaded in accordance with the American Standard for Screw Threads for High Strength Bolting (ASA No.: B 1.4-1945), sizes 1 inch and smaller in diameter with the coarse-thread series, and $1\frac{1}{8}$ inches and larger in diameter with the 8-pitch thread series.

(e) The bolt length shall be measured from under the head to the end of the bolt.

SUBPART 51.55—CARBON AND ALLOY-STEEL NUTS FOR HIGH-TEMPERATURE SERVICE

NOTE: In substantial agreement with A. S. T. M. Designation: A 194-46.¹ Certified material—class B.

§ 51.55-1 *Scope.* (a) This specification covers steel nuts for bolts used in high temperature service up to 1,000° F.

(b) Four classes of material are covered:

Class 1 for service temperatures not exceeding 750° F.

Classes 2 and 2H for service temperatures not exceeding 850° F.

Class 4 for service temperatures up to and including 1,000° F.

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

§ 51.55-5 *Process.* The steel shall be made by one or more of the following processes: open-hearth, electric-furnace, or acid-bessemer.

§ 51.55-10 *Fabrication.* (a) Class 1 or 2 nuts shall be made by the hot-forged or cold process, or machined from hot-forged or hot-rolled bars.

(b) Class 2H or 4 nuts shall be made by the hot-forged or cold-process, or machined from hot-forged or hot-rolled bars and shall be heat-treated to meet the required physical properties. These classes of nuts shall be quenched and tempered at a temperature not less than 850° F. for class 2H and not less than 1,100° F. for class 4 nuts.

§ 51.55-15 *Stress relieving.* (a) Before tapping, all nuts made by the cold-process shall be heated in the process of manufacturing to a temperature of at least 1,000° F.

(b) Nuts made by the hot process or from hot-forged or hot-rolled bars need not be subjected to this stress relieving.

§ 51.55-20 *Chemical composition.* Nuts shall conform to the following requirements as to chemical composition:

TABLE 51.55-20—CHEMICAL COMPOSITION

Chemical elements	Class 1	Class 2 or 2H	Class 4
	Percent	Percent	Percent
Carbon	0.15	0.40	0.40 to 0.50
Manganese			0.50 to .95
Phosphorus, maximum	.05	.05	.04
Sulfur, maximum	.05	.05	.05
Silicon			1.15
Molybdenum			1.20

¹ Minimum.

§ 51.55-25 *Hardness test.* (a) Samples of each class of nuts shall show the Brinell hardness specified below:

TABLE 51.55-25 (a)—BRINELL HARDNESS

Class	Sample nut as finished (minimum)	Sample nut after treatment as above (minimum)
1	120	120
2	160	160
2H	245 to 352	180
4	245 to 352	200

(1) In the finished condition.

(2) After the sample has been subjected for 24 hours to a temperature of 850° F. for class 1, 1,000° F. for class 2 or 2H, and 1,100° F. for class 4, and then cooled slowly.

(b) Hardness tests shall be made on the side of the nut.

§ 51.55-30 *Drift test.* Class 2H or 4 nuts when machined from bar stock and all other classes of nuts shall be capable of meeting the following drift test: A conical mandrel, part of which has a diameter equal to the nominal nut size, shall be forced through the tapped hole to the nominal nut size, cold, without cracking the body of the nut. The test may be continued until the nut is broken for the examination of the structure.

§ 51.55-35 *Stripping test.* Nuts of all classes shall be capable of meeting the following stripping test: A nut shall be

assembled on a piece of bolting material held in a tension testing machine so that a load is applied to the nut. The threads in the nut shall not strip when subjected to a stress equal to 130,000 p. s. i. for class 1, and 150,000 p. s. i. for class 2, 2H, or 4, figured from the mean diameter of the bolt.

§ 51.55-40 *Retests.* If the results of any physical test do not conform to the requirements specified, two additional tests from the same lot shall be made, each of which shall conform to the requirements specified.

§ 51.55-45 *Finish.* (a) Nuts shall be free from injurious defects and shall have a workmanlike finish.

(b) Nuts shall be semifinished, hexagonal in shape and in accordance with the dimensions for the regular or heavy series of the American Standard for Wrench-Head Bolts and Nuts and Wrench Openings (ASA No.: B 18.2-1941). Unless otherwise specified, the American Standard heavy series shall be used.

(c) Nuts for use with alloy-steel bolts or bolt studs shall be threaded, unless otherwise specified, in accordance with the American Standard for Screw Threads for High Strength Bolting (ASA No.: B 1.4-1945); size 1 inch and smaller in diameter with the coarse-thread series, and $1\frac{1}{8}$ inch and larger in diameter with the 8-pitch thread series.

SUBPART 51.58—STEEL CASTINGS

NOTE: In substantial agreement with A. S. T. M. Designations: A 95-44, A 157-44, A 216-44T, and A 217-46T.¹ Certified material—class B.

§ 51.58-1 *Scope.* (a) This specification covers steel castings for valves, flanges, fittings, or other pressure containing parts, of carbon-steel for service at metal temperatures up to and including 850° F. and alloy-steel for service at metal temperatures up to 1,000° F., and of a quality suitable for arc or gas welding.

(b) Three grades of carbon-steel castings are covered, designated grades A, WCA, and WCB, and 16 grades of alloy-steel castings, including 14 ferritic steels designated grades C1, C3A, C3B, C4, C5A, C5B, C6, C11, C12, WC1, WC1A, WC2, WC3, and WC4, and two austenitic steels, designated grades C9 and C10.

(c) Grades WCA, WCB, WC1, WC1A, WC2, WC3 and WC4, are suitable for arc or gas welding.

(d) Other grades may be considered weldable when employing proper welding technique approved by the Commandant.

§ 51.58-5 *Process.* The steels shall be made by the open-hearth, electric-furnace, or the crucible process.

§ 51.58-10 *Heat treatment.* (a) All castings shall receive a heat treatment proper to their design and chemical composition.

¹ Copies of these A. S. T. M. specifications have been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

TABLE 51.58-15—CHEMICAL COMPOSITION—Continued
ALLOY STEEL

Type	Identification symbols	Ferritic steels				
Grade		C1	C3A	C3B	C4	C5A
Carbon, maximum	Percent	0.35	0.30	0.30	0.45	0.30
Manganese, maximum		1.00	1.00	1.00	1.00	1.00
Phosphorus, maximum		.05	.05	.05	.05	.05
Sulfur, maximum		.06	.06	.06	.06	.06
Silicon, maximum		.20 min.	.75 max.	.75 to 1.25	.20 min.	.75 to 1.50
Nickel, maximum						
Chromium, maximum						
Molybdenum, maximum						
Tungsten, maximum						

Type	Identification symbol	Ferritic steels				Austenitic steels	
Grade		C6	C11	C12	C9 ¹	C10	
Carbon, maximum	Percent	0.15	0.45	0.30	0.15	0.15	20 percent nickel
Manganese, maximum		.75	1.00	1.00	1.00	1.00	8 percent chromium
Phosphorus, maximum		.05	.05	.05	.05	.05	
Sulfur, maximum		.06	.06	.06	.06	.06	
Silicon, maximum		.20 min.	.20 min.	1.00 max.	2.00 max.	2.00 max.	
Nickel, maximum							
Chromium, maximum		11.3 to 13.5	1.00 to 2.25	8.00 to 10.00	8.00 min.	8.00 min.	
Molybdenum, maximum		.30 max.	.30 to 0.40	1.10 to 1.50	18.00 min.	18.00 min.	
Tungsten, maximum			.40 to 0.80		as agreed upon	as agreed upon	

Type	Identification symbol	UNSPECIFIED ALLOYING ELEMENTS ¹			
Grade		WC1	WC2	WC3	WC4
Carbon, maximum	Percent	0.30	0.25	0.30	0.30
Manganese, maximum		4.70	4.70	4.70	4.70
Phosphorus, maximum		.05	.05	.05	.05
Sulfur, maximum		.06	.06	.06	.06
Silicon, maximum		.60	.60	.60	.60
Nickel, maximum					
Chromium, maximum					
Molybdenum, maximum					
Tungsten, maximum					

Type	Identification symbol	UNSPECIFIED ALLOYING ELEMENTS ¹			
Grade		WC1	WC2	WC3	WC4
Carbon, maximum	Percent	0.30	0.25	0.30	0.30
Manganese, maximum		4.70	4.70	4.70	4.70
Phosphorus, maximum		.05	.05	.05	.05
Sulfur, maximum		.06	.06	.06	.06
Silicon, maximum		.60	.60	.60	.60
Nickel, maximum					
Chromium, maximum					
Molybdenum, maximum					
Tungsten, maximum					

¹ Either molybdenum or tungsten shall be used.
² For the more severe general corrosive conditions, and when so specified, the carbon content shall not exceed 0.07 percent.

The addition of such elements as molybdenum, tungsten, titanium, columbium, and vanadium for purposes of stabilization shall be a matter of agreement between the manufacturer and the purchaser.
 When the purchaser requires free-machining or better nonseizing and nongalling properties, the composition may contain suitable combinations of selenium and phosphorus or molybdenum and sulfur.

Selenium and phosphorus:
 Selenium, percent..... 0.20 to 0.35
 Phosphorus, maximum percent..... .17
 Molybdenum and sulfur:
 Molybdenum, percent..... 0.40 to 0.80
 Sulfur, percent..... .20 to .40

range, and cooling in still air to a temperature below the critical range.

(f) (1) *Grade WCA or WCB.* The procedure for drawing, shall consist in heating the castings to at least 1,100° F. and holding at that temperature not less than 1 hour per inch or less of section, followed by cooling in the furnace or in still air.

(2) *Alloy-steel castings.* The procedure for drawing, except as noted in paragraph (g), shall consist in heating the castings between 1,100° and 1,250° F. and holding at that temperature not less than 1½ hours per inch or less of section, followed by cooling in the furnace or in still air.

(g) The procedure for stabilizing grade C9 or C10 austenitic alloy-steels, shall consist in heating to the proper stabilizing temperature and holding at that temperature for sufficient time, followed by rapid air cooling or by quenching in a liquid medium.

(h) The furnace temperatures for heat treating shall be effectively controlled by pyrometers.

§ 51.58-15 *Chemical composition.* The steels shall conform to the following requirements as to the chemical composition:

TABLE 51.58-15—CHEMICAL COMPOSITION
CARBON STEELS

	Grade A	Grade WCA	Grade WCB
Carbon	Percent	Percent	Percent
Manganese	0.15 to 0.45	0.25	0.25
Phosphorus, maximum	1.50	1.70	1.70
Sulfur, maximum	.05	.05	.05
Silicon	.06	.06	.06
	1.20	1.20	1.60

For each reduction of 0.01 percent below the specified maximum carbon content, an increase of 0.04 percent manganese above the specified maximum will be permitted up to a maximum of 1.10 percent.

These unspecified alloying elements may be permitted in grades WCA or WCB, and shall be limited to the percent concentrations as indicated in the table. The determination of these chemical compositions shall be a matter of agreement between the manufacturer and purchaser.

(b) Heat treatment shall consist of full annealing; or of normalizing; or of normalizing followed by full annealing; or of normalizing followed by drawing to a temperature below the critical range; or of full annealing followed by normalizing, followed by drawing to a temperature below the critical range. No castings which have been quenched in any liquid medium shall be offered under this specification, except that liquid quenching shall be permitted for austenitic alloy-steel only.

(c) All castings that are to be heat-treated in any manner shall have been allowed to cool, after pouring, to a temperature below the critical range, under suitable conditions to prevent injuries by too rapid cooling.

(d) The procedure for full annealing shall consist in uniformly heating the castings to the proper temperature above the critical range, and for the required time to refine the grain, and cooling uniformly in the furnace to a metal temperature below the critical range. The castings shall not be removed from the furnace until a metal temperature of approximately 500° F. has been attained.

(e) The procedure for normalizing shall consist in heating the castings to the proper temperature above the critical

⁴In the case of grades WC1, WC2, WC3, and WC4 for each reduction of 0.01 percent below the specified maximum carbon content, an increase of 0.04 percent manganese above the specified maximum will be permitted up to a maximum of 1.10 percent.

⁵These unspecified alloying elements may be permitted in grades WC1, WC2, WC3, and WC4 and shall be limited to the percent concentrations as indicated in the table. The determination of these chemical compositions shall be a matter of agreement between the manufacturer and purchaser.

§ 51.58-20 *Tensile properties.* (a) Steels used for the castings shall conform to the following requirements as to tensile properties:

TABLE 51.58-20—PHYSICAL PROPERTIES
CARBON STEELS

Physical requirements	Grade A	Grade WCA	Grade WCB
Tensile strength, minimum, p.s.i.	70,000	60,000	70,000
Yield point, minimum, p.s.i.	36,000	30,000	36,000
Elongation in 2 inches, minimum, percent	22	24	22
Reduction of area, minimum, percent	30	35	35

ALLOY STEELS

Grade	Tensile strength, minimum, p. s. i.	Yield point, minimum, p. s. i.	Elongation in 2 inches, minimum, percent	Reduction of area, minimum, percent
CL	70,000	45,000	22	35
C3A	90,000	60,000	18	30
C3B	90,000	60,000	18	30
C4	100,000	65,000	18	30
C5A	90,000	60,000	18	30
C5B	90,000	60,000	18	30
C6	85,000	55,000	20	40
C9	70,000	30,000	35	40
C10	65,000	30,000	30	35
C11	100,000	65,000	18	30
C12	90,000	60,000	18	30
WC1 ¹	70,000	45,000	22	35
WC1A ¹	70,000	40,000	20	35
WC2	65,000	35,000	24	35
WC3	70,000	45,000	22	35
WC4	80,000	55,000	20	35

¹Grade WC1 when specified in the full-annealed condition is designated grade WC1A.

(b) The yield point shall be determined by the drop of the beam or halt in the gauge of the testing machine, or by the use of dividers, at a crosshead speed not to exceed $\frac{1}{8}$ inch per minute. Where a definite yield point is not exhibited, the yield strength corresponding to a limiting permanent offset of 0.2 percent of the gauge length of the specimen shall be used instead. The "offset method" of determining yield strength as described in the Tentative Methods of Tension Testing of Metallic Materials (A. S. T. M. Designation: E-8) of the American Society for Testing Materials shall be followed. The tensile strength shall be determined at a speed of head not to exceed $1\frac{1}{2}$ inches per minute.

§ 51.58-25 *Bending properties.* The test specimens for all grades, excepting grade C9 in which case the bending shall be through an angle of 120° , shall stand being bent cold through an angle of 90° to an inside diameter of one inch without cracking on the outside of the bent portion.

§ 51.58-30 *Hydrostatic tests.* (a) Castings intended for use as pipe flanges and flanged fittings shall be tested after machining to the hydrostatic test pressures specified in tables 55.07-15 (e10) and 55.07-15 (e11), and show no leaks.

(b) Pressure containing castings other than those specified in paragraph (a) shall be tested to the hydrostatic pres-

sure required by section 54.01-40 of this subchapter, and show no leaks.

§ 51.58-35 *Test specimens.* (a) For castings having a net weight of not over 500 pounds, tension test specimens and, when specified, bend test specimens shall be taken from test bars attached to special blocks. For castings having a net weight over 500 pounds, the test specimens shall be taken from test bars attached to the castings where practicable. If the design of the casting is such that test bars should not be attached to the castings, the test bars shall be cast attached to special blocks. Test bars from which tension and bend test specimens are to be taken shall remain attached to the castings or blocks they represent until presented for inspection, and shall be heat-treated with the castings. Test bars shall be provided in sufficient numbers to furnish specimens for the tests required in § 51.58-40.

(b) Tension test specimens may be cut from heat-treated castings instead of from test bars.

(c) Tension test specimens shall be machined to the form and dimensions shown in figure 51.04-35 (f).

(d) Bend test specimens shall be machined to 1 by $\frac{1}{2}$ inch in section with the corners rounded to a radius not over $\frac{1}{16}$ inch.

§ 51.58-40 *Number of tests.* (a) One tension test and when specified, one bend test shall be made from each melt in each heat-treatment charge and from each casting weighing 500 pounds net or over.

(b) If any test specimen shows defective machining or develops flaws, it may be discarded, and another specimen substituted from the same lot.

(c) If the percentage of elongation of any tension test specimen is less than that specified in § 51.58-20 (a) and any part of the fracture is more than $\frac{3}{4}$ inch from the center of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

§ 51.58-45 *Retests.* If the results of the physical tests for any lot do not conform to the requirements specified such lot may be re-heat-treated, but not more than twice. Retests shall be made as specified in §§ 51.58-20 and 51.58-25.

§ 51.58-50 *Workmanship.* (a) The castings shall conform substantially to the shapes and sizes indicated by the patterns and drawings submitted by the purchaser.

(b) Flanged castings from which the flanges have been machined away to make weld end castings shall not be furnished under this specification.

(c) Welding ends shall be suitably protected against damage during shipment.

§ 51.58-55 *Finish.* (a) The castings shall be clean and free from injurious defects.

(b) The castings shall not be peened or plugged to stop leaks.

(c) Welding repairs. For detail requirements of repairs to defective steel castings, see §§ 57.15-5 and 57.15-10 of this subchapter.

§ 51.58-60 *Marking.* Identification marks consisting of the manufacturer's name or trade mark, primary service pressure rating, grade of material, the melt number or melt identification on all pressure containing castings, and the size shall be legibly cast or stamped on each casting and in such position as not to injure the usefulness of the castings.

SUBPART 51.61—MALLEABLE IRON CASTINGS

NOTE: In substantial agreement with A. S. T. M. Designations: A 47-33 and A 197-39.¹ Certified material—class B.

§ 51.61-1 *Scope.* This specification covers two grades of malleable iron castings, designated grade A or grade B, which may be used for pipe fittings, valves, manifolds, connections, and miscellaneous appliances, including pipe fittings and valve parts to be manufactured in advance and supplied from stock by the manufacturer.

§ 51.61-5 *Process.* (a) Grade A castings shall be made by the air-furnace, open-hearth, or electric-furnace process.

(b) Grade B castings shall be made by the cupola process, and shall be produced under regular chemical and physical control.

(c) Irrespective of the process by which the castings are made they shall be free from primary graphite, or what is known in the trade as a "frame," and the manufacturer shall certify that no primary graphite is present in any part of the casting sections.

(d) Castings having a "frame," i. e., a hard surface shell, shall be rejected.

NOTE: The normal structure of malleable iron consists of crystalline grains of ferrite throughout which are distributed small nodules of temper carbon. At times, due to an incorrect annealing cycle, the castings will be surrounded by more or less thick shell of metal in which the carbon will be combined to form the constituent known as pearlite. As this constituent is much harder than ferrite, the shell of metal, or "frame" will be harder and more brittle than the core of metal it surrounds, and consequently less able to safely stand dynamic stresses.

§ 51.61-10 *Tensile properties.* (a) The tensile test specimens shall conform to the following minimum requirements:

TABLE 51.61-10 (a)—PHYSICAL PROPERTIES

Physical requirement	Grade A	Grade B
Tensile strength, minimum, p. s. i.	53,000	40,000
Yield point, minimum, p. s. i.	35,000	30,000
Elongation in 2 inches, minimum, percent	18	5

(b) The yield point shall be determined by the drop of the beam or the halt in the gauge of the testing machine.

§ 51.61-15 *Test specimens.* (a) Tension test specimens shall be of the form shown in figure 51.61-15. Specimens

¹Copies of these A. S. T. M. specifications have been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

whose minimum diameter at the smallest section is less than $\frac{1}{32}$ inch shall not be accepted.

(b) Manufacturers shall keep records of the chemical composition and physical properties of the test specimens for grade B castings which shall be available to the inspectors.

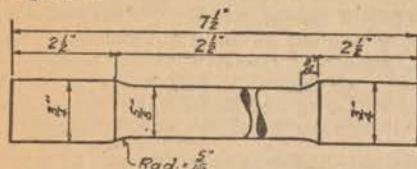


FIGURE 51.61-15—Standard form of test specimen required for tension tests of malleable iron castings.

§ 51.61-20 *Number of tests—(a) Grade A.* (1) A set of three tension-test specimens shall be cast from each melt, without chills, using heavy risers of sufficient height to secure sound bars. Each set of specimens so cast shall be annealed with the castings they represent.

(2) If the first specimen conforms to the specified requirements, or if, in the event of the failure of the first specimen, the second and third specimens conform to the requirements, the castings of the lot they represent shall be accepted, except that any casting may be rejected if its test lug shows that it has not been properly annealed. If either the second or third specimen fails to conform to the requirements, the entire lot of castings they represent shall be rejected unless failure of one of the retest specimens shall be due to a flaw, in which case test specimens may, at the discretion of the inspector, be cut from castings in the lot for an additional test.

(b) *Grade B.* Two tension-test specimens shall be cast from each 4 hours of the run or fraction thereof. Patterns for tension test specimens shall have adequate risers to secure sound bars. Specimens shall be suitably marked for identification as to date, cupola, and approximate hour of pouring. Test specimens shall be annealed with castings.

§ 51.61-25 *Special tests; Grade A.* (a) Castings, if of sufficient size, shall have cast thereon test lugs of a size proportional to the thickness of the casting, but not exceeding $\frac{5}{8}$ inch by $\frac{3}{4}$ inch in cross section. On castings which are 24 inches or over in length a test lug shall be cast near each end. These lugs shall be attached to the casting at such a point that they will not interfere with the assembling of the casting and shall be broken off by the inspector.

(b) If required by the inspector, a grade A casting shall be tested to destruction. Such a casting shall show good tough malleable iron.

§ 51.61-30 *Reannealing.* Any grade A castings rejected for insufficient annealing may be reannealed once. The reannealed castings shall be inspected, and if the remaining test lugs, or castings broken as specimens, show the castings to be thoroughly annealed, they shall be accepted; if not, they shall be finally rejected.

§ 51.61-35 *Workmanship and finish.* (a) All castings shall conform substan-

tially to the approved patterns or drawings, and also to gauges which may be specified in individual cases. The castings shall be made in a workmanlike manner. A variation of $\frac{1}{8}$ inch per foot will be permitted.

(b) Castings shall be free from injurious defects at surface or in any cross section.

§ 51.61-40 *Marking.* Valves, flanges, and fittings shall be marked as required by § 55.07-10 (f) of this subchapter.

§ 51.61-45 *Inspection and rejection.* (a) The manufacturer shall be required to keep a record of each melt from which castings are produced, showing tensile strength and elongation of test specimens cast from such melts. These records shall be available and shown to the inspector whenever required.

(b) Castings which show injurious defects subsequent to their acceptance at the manufacturer's works may be rejected and, if rejected, the manufacturer shall be notified.

SUBPART 51.64—GRAY IRON CASTINGS FOR VALVES, FLANGES, AND PIPE FITTINGS

NOTE: In substantial agreement with A. S. T. M. Designation: A 128-40.¹ Certified material—Class B.

§ 51.64-1 *Scope.* This specification covers the following three grades of gray iron for castings such as valve bodies, fittings, flanges, including parts to be assembled into valves, manufactured in advance and supplied for sale from stock by the manufacturer, jobber, or other dealer:

Grade A—Regular gray iron.

Grade B—Higher-strength gray iron including the so-called semisteels used in valves and fittings.

Grade C—High-test cast iron, whether regular or alloy composition.

§ 51.64-5 *Process.* The iron shall be made by the cupola, air-furnace, electric-furnace, or other approved process. The iron shall be produced under regular chemical and physical control and shall be gray iron of high quality.

§ 51.64-10 *Chemical composition.* Drillings taken from test ingots, broken test specimens, or from castings shall conform to the following requirements as to chemical composition:

Phosphorus, maximum, percent..... 0.75
Sulfur, maximum, percent..... .12

§ 51.64-15 *Tensile properties.* (a) The tension-test specimen shall conform to the following requirements as to tensile strength:

TABLE 51.64-15 (a)—PHYSICAL PROPERTIES

	Grade A	Grade B	Grade C
Tensile strength, minimum, p. s. i.....	21,000	31,000	41,000

(b) After reaching a stress of 15,000 pounds per square inch, the speed of the

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

crosshead of the testing machine shall not exceed $\frac{1}{8}$ inch per minute.

§ 51.64-20 *Transverse test.* (a) The transverse test shall be optional. When transverse tests are made, the transverse test specimen when placed horizontally upon supports 12 inches apart and tested under a centrally applied load shall conform to the following requirements:

TABLE 51.64-20 (a)—TRANSVERSE TEST

	Grade A	Grade B	Grade C
Load at center, minimum, pounds.....	2,200	3,300	4,000
Deflection at center, minimum, inches.....	0.10	0.12	0.12

(b) The rate of application of the load shall be such that a central deflection of 0.10 inch is produced in from 20 to 40 seconds.

(c) In case the transverse test specimen varies from the specified diameter of 1.20 inches, a correction factor conforming to the following shall be applied:

TABLE 51.64-20 (c) CORRECTION FACTORS

Diameter of transverse test specimen (inches):	Correction factor	Diameter of transverse test specimen (inches)—Con.	Correction factor
1.10	0.770	1.21	1.025
1.11	.791	1.22	1.051
1.12	.813	1.23	1.077
1.13	.835	1.24	1.103
1.14	.857	1.25	1.130
1.15	.880	1.26	1.158
1.16	.903	1.27	1.185
1.17	.927	1.28	1.214
1.18	.951	1.29	1.242
1.19	.975	1.30	1.271
1.20	1.000		

§ 51.64-25 *Mold.* One mold containing one or more tension test specimens and, when desired, one transverse test specimen shall be poured at least twice a day from each melt from which castings are made under this specification. The molds for these test specimens shall be made from plate pattern, on a standard molding machine if possible, from the same lot of sand and in the same general way as that in which molds for the castings are made. Each specimen shall be marked to show cupola or furnace number, date, and hour when the mold is poured by either casting in the mold or stamping the specimens as soon as possible after shaking out.

§ 51.64-30 *Test specimens.* Tension-test specimens shall conform to the dimensions shown in figure 51.64-30, shall be reasonably smooth and round at breaking section, and shall be tested without machining except that the enlarged ends shall be threaded ($1\frac{3}{4}$ inches U. S. standard threads are recommended). The cross-sectional area at the breaking section shall be within plus or minus 5 percent of 1 square inch and the ultimate stress shall be calculated on the minimum cross section.

§ 51.64-35 *Tension-test apparatus.* Ball and socket specimen holders or spherical-seated bearings or other device which will insure that the specimen, when under load, will be as nearly as

possible in pure axial tension without transverse stress shall be used in making the tension test.

§ 51.64-40 *Records.* Records of the chemical composition of the iron and physical properties of the test specimens shall be systematically made and maintained.

§ 51.64-45 *Workmanship and finish.* The castings shall be sound, clean, free from sand, of workmanlike finish, and soft enough to machine well.

§ 51.64-50 *Marking.* Valves, flanges, and fittings shall be marked as required by § 55.07-10 (f) of this subchapter.

SUBPART 51.67—COPPER-ALLOY PLATE

NOTE: In substantial agreement with A. S. T. M. Designation: B 171-46.¹ Certified material—class B.

§ 51.67-1 *Scope.* This specification covers three grades of copper-alloy rolled

plate suitable for use as shells and tube sheets of heat exchangers and unfired pressure vessels. These grades shall be designated grade A, naval brass; grade B, copper-nickel alloy; and grade C, aluminum bronze. Grade A shall not be used for temperatures exceeding 406° F. and grade B or C shall not be used for temperatures exceeding 450° F.

§ 51.67-5 *Manufacture.* (a) The plates shall be hot-rolled to size from an alloy made from lake or electrolytic copper in combination with one or more of the following materials: copper, zinc, nickel, aluminum, and tin.

(b) Clean new scrap resulting from manufacturing operations upon material conforming to this specification or composed of materials of equal purity may be used.

§ 51.67-10 *Chemical composition.* The plates shall conform to the following requirements as to chemical composition:

TABLE 51.67-10—CHEMICAL COMPOSITION

Chemical elements	Grade A naval brass ¹	Grade B copper-nickel alloy	Grade C aluminum bronze
	Percent	Percent	Percent
Copper	59.00 to 61.00	1.50 maximum	Remainder
Tin	.50 to 1.00	29.00 to 33.00	4.00 to 7.00
Nickel		1.00 maximum	.50 to 2.00
Manganese	.20 maximum	.05 maximum	
Lead	.10 maximum	.60 maximum	1.50 to 3.50
Iron	.10 maximum		.50 maximum
Other impurities	Remainder	1.00 maximum	8.00 to 11.00
Zinc			
Aluminum			

¹ In naval brass it shall be permissible to add arsenic or antimony or phosphorus up to 0.10 percent.

§ 51.67-15 *Chemical analysis.* (a) Analysis shall be made on each lot of 5,000 pounds or fraction thereof.

(b) The sample for chemical analysis shall be taken by drilling or milling representative plates in such a way that a sample of the entire thickness of the plates shall be obtained.

§ 51.67-20 *Tensile properties.* The plates shall conform to the following requirements as to tensile properties:

TABLE 51.67-20—PHYSICAL PROPERTIES

Grade	Alloy	Tensile strength, minimum (p. s. i.)	Yield strength, minimum (p. s. i.)	Elongation in 2 inches, minimum (percent)
A	Naval brass	50,000	20,000	35.0
B	Copper-nickel alloy	50,000	20,000	35.0
C	Aluminum bronze	90,000	36,000	10.0

¹ Yield strength shall be determined as the stress producing an elongation under load of 0.5 percent, that is, 0.01 inches in a gauge length of 2 inches.

§ 51.67-25 *Bending properties.* The bend-test specimen shall stand being bent cold through 120° around a pin, the diameter of which is equal to twice the thickness of the specimen, without cracking on the outside of the bent portion.

¹ A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

tion. Aluminum bronze plates will not be required to meet the bend test.

§ 51.67-30 *Test specimens.* (a) The tension test specimens shall be machined to the form and dimensions shown in figures 51.04-35 (d) or 51.04-35 (f).

(b) Bend test specimens from plates ½ inch or over in thickness shall be 0.5 inch by 1 inch in section with corners rounded to a radius of not over ⅛ inch. In the case of thinner plates, the specimens shall have the same thickness as the plate, with corners rounded to a radius equal to one-fourth of the thickness of the plate.

§ 51.67-35 *Workmanship and finish.* The plates shall be free from injurious

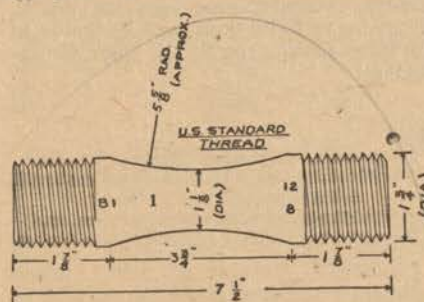


FIGURE 51.64-30—Standard form of test specimen required for tension tests of gray iron castings.

NOTE: The numbering on the test specimen shown in figure 51.64-30 is intended simply to illustrate a method of designation. In the particular method shown, 12/8 refers to December 8, B1 is the cupola number, and the numeral 1 which follows shows the hour cast (1 p. m.).

defects and have a smooth, clean surface such as results from rolling operation. The fracture shall be uniform in color and grain throughout.

§ 51.67-40 *Marking.* The name or brand of the manufacturer shall be lightly stamped on the thickness of each plate and on an outside surface in two places not less than 12 inches from the edges.

SUBPART 51.70—SEAMLESS BRASS PIPE

NOTE: In substantial agreement with A. S. T. M. Designation: B 43-46.¹ Certified material—Class B.

§ 51.70-1 *Scope.* This specification covers seamless red brass pipe in all standard pipe sizes, both regular and extra strong, suitable for steam, water, compressed air, sanitary, and boiler feed lines, and for similar purposes subject to temperatures not exceeding 406° F.

§ 51.70-5 *Manufacture.* The pipe shall be cold-drawn to size.

§ 51.70-10 *Temper.* All pipe shall normally be furnished in the annealed condition. The degree of anneal shall be sufficient to show complete recrystallization and to enable the pipe to meet the test requirements prescribed in this specification. The pipe may be furnished in the hard-drawn condition instead of the annealed condition.

§ 51.70-15 *Chemical composition.* The material shall conform to the following requirements as to chemical composition:

TABLE 51.70-15—CHEMICAL COMPOSITION

Copper, percent	83.00 to 86.00
Lead, maximum, percent	.06
Iron, maximum, percent	.05
Tin, maximum, percent	.15
Zinc	Remainder

§ 51.70-20 *Sampling for chemical analysis.* Drillings, millings, or chip-pings for analysis shall be taken from pipe representing 0.5 percent of the shipment. Equal quantities shall be taken from each pipe and thoroughly mixed together.

§ 51.70-25 *Expansion test.* (a) Annealed pipe shall stand an expansion of 25 percent of the inside diameter without cracking, when expanded by a tapered pin having a 60° included angle.

(b) As an alternate to the expansion test for pipe over 4 inches in diameter in the annealed condition, a section 4 inches in length shall be cut from the end of one of the lengths for a flattening test. This 4-inch specimen shall be flattened so that a gauge set at three times the wall thickness will pass over the pipe freely throughout the flattened part. The pipe so tested shall develop no cracks or flaws visible to the unaided eye as a result of this test. In making the flattening test the elements shall be slowly flattened by one stroke of the press.

§ 51.70-30 *Mercurous nitrate test.* A test specimen 6 inches in length shall withstand, without cracking, immersion for 15 minutes in an aqueous mercurous nitrate solution containing 100 grams of mercurous nitrate and 13 milliliters of nitric acid (sp. gr. 1.42) per liter of solution.

§ 51.70-35 *Bending properties.* In the case of pipe required for bending, annealed full sections of the pipe shall stand being bent cold through 180° around a pin the diameter of which is one and one-half times the inside diameter of the pipe, without cracking on the outside of the bent portion. This test shall apply only to sizes 2 inches and under in outside diameter.

§ 51.70-40 *Hydrostatic test.* Each length of pipe shall stand, without showing weakness or defects, an internal hydrostatic pressure sufficient to subject the material to a fiber stress of 7,000 p. s. i., determined by the following formula for thin hollow cylinders under tension. No pipe shall be tested beyond 1,000 p. s. i. unless so specified.

$$P = \frac{2St}{D} \quad (1)$$

where:

P = test pressure in p. s. i.,
S = allowable unit stress of the material,
7,000 p. s. i.
t = thickness of pipe wall in inches, and
D = outside diameter of pipe in inches.

§ 51.70-45 *Number of tests.* A sufficient number of pipes for purposes of tests shall be taken at random to constitute 0.5 percent of the shipment. One expansion test and one mercurous nitrate test shall be made on each pipe so selected.

§ 51.70-50 *Workmanship.* The pipe shall be commercially round and shall be free from cracks, slivers, scale, and other surface defects.

§ 51.70-55 *Finish.* All pipes shall be bright annealed or acid cleaned after final annealing.

§ 51.70-60 *Retests.* If a specimen of piping fails to meet the requirements of §§ 51.70-25 to 51.70-40, inclusive, two additional specimens may be taken, but both of these specimens shall conform to these requirements, otherwise the pipe will be rejected.

SUBPART 51.73—SEAMLESS COPPER PIPE

NOTE: In substantial agreement with A. S. T. M. Designation: B 42-46.¹ Certified material—class B.

§ 51.73-1 *Scope.* This specification covers seamless copper pipe in all standard pipe sizes both regular and extra strong to be used at temperatures not exceeding 406° F. This material is suitable for boiler-feed lines, blow-off lines, compressed air lines, salt and fresh water lines, and for saturated steam lines.

§ 51.73-5 *Manufacture.* The pipe shall be cold-drawn to size.

§ 51.73-10 *Condition or temper.* (a) All pipe shall be normally furnished in the hard-drawn condition.

(b) When pipe is required for bending, the pipe shall be furnished with a proper bending temper.

§ 51.73-15 *Chemical composition.* The copper shall conform to the follow-

¹A copy of this A. S. T. M. specification has been filed with this document in the Division of the Federal Register. Copies are also on file with the various Coast Guard District Commanders for reference purposes.

ing requirements as to chemical composition:

Copper,¹ minimum, percent..... 99.90
Phosphorus, maximum, percent..... 0.040

¹Silver counting as copper.

§ 51.73-20 *Sampling for chemical analysis.* Drillings, millings, or clippings for analysis shall be taken from pipe representing 0.5 percent of the shipment. Equal quantities shall be taken from each pipe and thoroughly mixed.

§ 51.73-25 *Expansion test.* (a) Annealed pipe selected for test shall withstand an expansion of 25 percent of the inside diameter when expanded by a tapered pin having a 60° included angle.

(b) As an alternate to the expansion test for pipe over 4 inches in diameter in the annealed condition, a section 4 inches in length shall be cut from the end of one of the lengths for a flattening test. This 4-inch specimen shall be flattened so that a gauge set at three times the wall thickness will pass over the pipe freely throughout the flattened part. The pipe so tested shall develop no cracks or flaws visible to the unaided eye as a result of this test. In making the flattening test the elements shall be slowly flattened by one stroke of the press.

§ 51.73-30 *Bending properties.* In the case of pipe required for bending, annealed full sections of the pipe shall stand being bent cold through 180° around a pin the diameter of which is one and one-half times the inside diameter of the pipe, without cracking on the outside of the bent portion. This test shall apply only to sizes 2 inches and under in outside diameter.

§ 51.73-35 *Microscopic examination.* The pipe shall be made from copper that is free from cuprous oxide as determined by microscopic examination at a 75× magnification.

§ 51.73-40 *Hydrostatic test.* Each length of pipe shall stand, without showing weakness or defects, and internal hydrostatic pressure sufficient to subject the material to a fiber stress of 6,000 p. s. i. determined by the following formula for thin hollow cylinders under tension. No pipe shall be tested beyond a hydrostatic pressure of 1,000 p. s. i. unless so specified. At the option of the manufacturer annealed pipe with wall thicknesses up to 0.083 inch may be tested in the hard-drawn condition, prior to annealing.

$$P = \frac{2St}{D} \quad (1)$$

where:

P = pressure in pounds per square inch,
S = allowable unit stress of the material,
6,000 p. s. i.,
t = thickness of pipe wall in inches, and
D = outside diameter of the pipe in inches.

§ 51.73-45 *Number of tests.* (a) A sufficient number of pipes for purpose of tests shall be taken at random to constitute 0.5 percent of the shipment. One expansion test shall be made on each pipe so selected.

(b) If any specimen fails to conform to the requirements of §§ 51.73-25, 51.73-30, 51.73-35, and 51.73-40, two additional specimens may be taken, each of which shall conform to the requirements specified.

§ 51.73-50 *Workmanship.* The pipe shall be commercially round and shall be free from cracks, seams, slivers, scale, and other surface defects.

SUBPART 51.76—BRONZE CASTINGS

NOTE: In substantial agreement with A. S. T. M. Designations: B 62-46, B 61-46, and B 143-46T.¹ Certified material—class B.

§ 51.76-1 *Scope.* This specification covers four grades of alloy castings designated as follows:

(a) Grade A (ounce metal) for pressure-containing parts of valves and pipe fittings which are subjected to working pressures up to 150 pounds per square inch or temperatures not exceeding 366° F.

(b) Grade B (steam bronze) for pressure-containing parts of valves and pipe fittings, also boiler mountings, expansion joints, and similar appliances which are subjected to steam pressures up to 300 pounds per square inch or temperatures not exceeding 450° F. and for hydraulic or compressed air service at higher pressures where the temperature does not exceed 150° F.

(c) Grades C1A and C1B ("G" bronze) for valves, pipe fittings, bolts, nuts, and pressure vessels where higher tensile strength and resistance to salt water corrosion are required, and which are subject to steam pressures up to 300 pounds per square inch or temperatures not exceeding 450° F. and for hydraulic or compressed air service at higher pressures where the temperature does not exceed 150° F.

§ 51.76-5 *Manufacture.* (a) The alloys may be made by any approved method.

(b) The castings shall be of uniform quality.

(c) The castings shall be made in accordance with such practice as to obtain the physical properties prescribed in this specification.

§ 51.76-10 *Chemical composition.* The alloy shall conform to the following requirements as to chemical composition:

TABLE 51.76-10—CHEMICAL COMPOSITION

Chemical elements	Grade A 85-5-5-5 ounce metal		Grade B Steam bronze	
	Mini- mum	Maxi- mum	Mini- mum	Maxi- mum
	Percent	Percent	Percent	Percent
Copper.....	84.0	86.0	86.0	90.0
Tin.....	4.0	6.0	5.5	6.5
Lead.....	4.0	6.0	1.0	2.0
Zinc.....	4.0	6.0	3.0	5.0
Nickel.....		1.00		1.00
Iron.....		.30		.25
Phosphorus.....		.05		.05

Chemical elements	Grade C1A 88-10-2 "G" bronze		Grade C1B 88-8-4 "G" bronze	
	Mini- mum	Maxi- mum	Mini- mum	Maxi- mum
	Percent	Percent	Percent	Percent
Copper.....	86.0	89.0	86.0	89.0
Tin.....	9.0	11.0	7.5	9.0
Lead.....		.30		.30
Zinc.....	1.0	3.00	3.0	5.0
Nickel.....		1.00		1.00
Iron.....		.15		.15
Phosphorus.....		.05		.05

¹In determining copper, minimum copper may be calculated as copper plus nickel.

§ 51.76-15 *Chemical analysis.* The sample for chemical analysis shall be taken by drilling or cutting the test coupon or sprue in such a manner as to be representative of the entire cross section.

§ 51.76-20 *Tensile properties.* (a) The alloys shall conform to the following requirements as to tensile properties:

TABLE 51.76-20—PHYSICAL PROPERTIES

Physical requirements	Grade A	Grade B	Grades C1A and C1B
Tensile strength, minimum, p. s. i.	30,000	34,000	40,000
Yield strength, minimum, p. s. i.	14,000	16,000	18,000
Elongation in 2 inches, minimum, percent.	20	22	20

(b) The yield strength shall be determined as the stress producing an elongation under load of 0.5 percent, that is, 0.01 inch in a gauge length of 2 inches.

§ 51.76-25 *Test specimens.* (a) The tension test specimen shall be machined from a coupon to the form and dimensions shown in figure 51.76-25 (f).

(b) The coupon attached to the casting shall conform to the dimensions shown in figure 51.76-25 (b) and it shall not be chilled. The fin gate along the side shall be not less than $\frac{5}{16}$ inch in thickness at any point along its length.

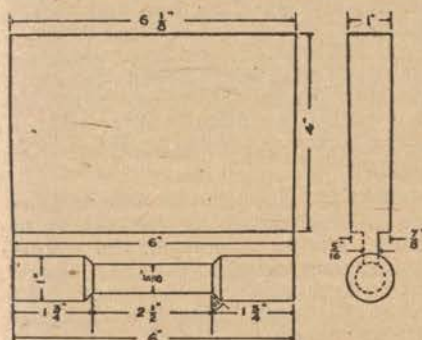


FIGURE 51.76-25 (b)—Standard form of test specimen coupon required for tension tests of bronze castings.

(c) Alternate test specimens approved by the Commandant may be used in lieu of the machined test specimen as required by paragraph (b).

§ 51.76-30 *Number of tests.* (a) Each casting weighing 250 pounds or more shall have, if practicable, at least one test coupon attached. The responsibility of furnishing sufficient test specimens shall rest with the manufacturer.

(b) In the case of castings weighing less than 250 pounds each, except as specified in paragraph (d), at least one test coupon shall, if practicable, be attached to one or more castings from each melt or from such groups of melts as the inspector may specify, but in no case shall a group consist of more than 1,000 pounds of castings.

(c) In the case of castings where, in the opinion of the inspector it is impracticable to attach a test coupon to the casting, bars shall be cast separately in sand. At least one test bar shall be poured from each melt of metal, or such groups of melts as the inspector may

specify, but in no case shall a group consist of more than 1,000 pounds of castings. The bars shall be cast from the first metal poured from the melt, and the inspector shall witness the pouring of the test mold.

(d) In the case of grade C1A or C1B castings, three test coupons shall be poured from each melt of metal or such groups of melts as the purchaser may specify, but in no case shall a lot consist of more than 1,000 pounds of castings, except if individual castings weigh more than 1,000 pounds. The inspector shall witness the pouring of the test melts.

(e) If any test specimen shows defective machining or reveals casting defects, it may be discarded and replaced by another specimen selected by the inspector. If additional test coupons are not available, the replacement specimen may be taken from the body of a casting selected by the inspector to represent the lot. In the case of grade C1A or C1B castings the two remaining specimens shall be tested. If the average properties of the two remaining specimens conform to the requirements specified the lot shall be accepted.

§ 51.76-35 *Workmanship and finish.*

(a) The castings shall be free from blowholes, porosity, hard spots, shrinkage defects, or cracks, or other injurious defects and shall be smooth and well cleaned, before inspection, by sand blasting, tumbling, chipping, or other process acceptable to the inspector.

(b) The castings shall not be repaired, plugged, welded or "burned in," unless permission from the inspector has been previously secured. This permission will be given only when the defects are such that after the approved repair the usefulness and strength of the casting has not been impaired. Each such repair shall be encircled by a ring of white paint at the time of shipment.

(c) All castings shall be true to pattern, free from swells, etc. Wall thickness shall be uniform throughout the lot of castings and all cores shall be accurately set.

(d) Where thick and thin sections join, the manufacturer, shall be permitted to add (where not previously provided) fillets of proper size to avoid cracking upon cooling, subject to the acceptance by the inspector.

§ 51.76-40 *Marking.* Valves, flanges, and fittings shall be marked as required by § 55.07-10 (f) of this subchapter.

§ 51.76-45 *Certification.* Manufacturers are required to file affidavits with the Commandant, in accordance with § 57.20-15 of this subchapter, certifying that all castings intended for marine service will comply with this specification.

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52.01-10 Computations.
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- Sec.
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AUTHORITY: §§ 52.01-1 to 52.70-55, inclusive, issued under R. S. 4405, 4417a, 4418, 4426, 4427, 4429, 4430, 4431, 4432, 4433, 4434, 4453, and 4491, as amended, sec. 14, 29 Stat. 690, 41 Stat. 305, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 363, 366, 367, 375, 391a, 392, 404, 405, 407, 408, 409, 410, 411, 412, 435, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.

SUBPART 52.01—PROCEDURE AND GENERAL REQUIREMENTS

§ 52.01-1 *Definitions*—(a) *Main boiler*. A main boiler is a steam boiler used for generating steam for propulsion purposes on shipboard.

(b) *Auxiliary boiler*. An auxiliary boiler is a steam boiler used for all purposes on shipboard for which steam may be required other than propulsion.

(c) *Donkey boiler*. A donkey boiler is a steam boiler installed on a vessel for occasional use for any purpose for which steam is required other than propulsion.

(d) *Pressure vessel*. A pressure vessel is an unfired vessel containing gases, vapors, or liquids under pressure. (See § 54.01-10 of this chapter.)

(e) *Water-tube boiler*. A water-tube boiler is a steam boiler in which the boiler tubes contain water, and is composed generally of drums, headers, and tubes.

(f) *Internally fired fire-tube boiler*. An internally fired fire-tube boiler is a steam boiler containing furnaces, one or more combustion chambers and tubes or flues through which the products of combustion pass from the furnace to the uptake. In such boilers no part of the shell is in contact with the fire or products of combustion.

(g) *Externally fired fire-tube or flue boiler*. An externally fired fire-tube or

flue boiler is a steam boiler, part of the outer shell of which is exposed to fire or to the products of combustion, and containing flues through which such products pass from the furnace to the uptake.

(h) *Factor of safety*. Factor of safety is the ratio of the ultimate strength of the material to the working stress.

(i) *Pressure or p. s. i.* Pressure or p. s. i. is the gauge pressure or the pressure above atmospheric pressure in pounds per square inch.

(j) *Design pressure*. Design pressure is the theoretical bursting pressure of the weakest part of a boiler, pressure vessel, or piping divided by its factor of safety.

(k) *Maximum allowable pressure*. The maximum allowable pressure of a boiler and its superheater shall be considered as the highest setting of the safety valves on the drum.

(l) *Temperature*. A high temperature is a temperature above 500° F.; a low or moderate temperature is a temperature up to and including 500° F.

(m) *Repair*. Repair is the restoration of any damaged or impaired part to an effective and safe condition.

(n) *Alteration*. Alteration is a structural modification of or departure from an approved design or existing construction.

§ 52.01-5 *Drawings*. (a) Manufacturers intending to construct boilers, or other pressure vessels consisting primarily of riveted, welded, brazed, or seamless shells, to be installed on vessels subject to inspection by the Coast Guard, shall submit to the Officer in Charge, Marine Inspection, in whose district such boilers or pressure vessels are to be installed, drawings in triplicate which shall be fully descriptive of the boilers or pressure vessels to be manufactured. These requirements also apply to the steam and water drums of water-tube boilers.

(b) Manufacturers of water-tube boilers, or other types of pressure vessels, or of pressure fittings or appliances, to be installed on vessels subject to inspection by the Coast Guard, shall submit to the Commandant drawings which shall be fully descriptive of the boilers, pressure vessels, fittings, or appliances to be manufactured. Such manufacturers shall also upon request furnish to the Commandant a sufficient number of copies thereof for distribution by him to the offices of all inspectors.

(c) The procedure specified in paragraphs (a) and (b) shall apply also to proposed alterations.

§ 52.01-10 *Computations*. It shall be the duty of the Officer in Charge, Marine Inspection, upon receipt of drawings of a boiler or other pressure vessel, submitted to him for approval, to make calculations of each component part of such boiler or pressure vessel, using the formulas provided in the various sections of this part, and to make a record of such computations to be filed with the drawings. Such computations shall be headed with a general description and identification of the boiler or pressure vessel. In making such computations, the minimum tensile strength of the specified range of the material shall be used.

§ 52.01-15 *Conditions for approval*.

(a) The Officer in Charge, Marine Inspection, shall satisfy himself by examination of the drawings that the design is satisfactory in the following particulars:

(1) That it conforms to all of the requirements of Parts 50 to 57, inclusive, of this subchapter.

(2) That no design will produce unusual stresses which are not fully provided for by proper material or construction.

(3) That manhole or other openings are adequate and so placed as to permit easy access to the interior for inspection or cleaning, and that no part of the interior construction obstructs such openings.

(4) That each part is of sufficient strength for safe operation at the maximum pressure requested.

(5) That all joints are designed in accordance with good engineering practice.

(6) That the proposed water level is shown on the drawing and conforms to the requirements of § 52.70-50.

(b) Upon determining that the design of the boiler or pressure vessel complies with all of the requirements herein specified, the Officer in Charge, Marine Inspection, shall approve the drawings and record thereon the maximum allowable pressure under which the boiler or pressure vessel may be operated. He shall thereupon return one copy to the manufacturer and file the other copy in his office with the record of computations. If the Officer in Charge, Marine Inspection, is not satisfied that the design complies with the specified requirements, he shall notify the manufacturer with a written statement, giving his reasons for disapproval.

§ 52.01-20 *Appeals*. In case the design is disapproved by the Officer in Charge, Marine Inspection, the manufacturer may appeal to the Coast Guard District Commander of the district, and should the Coast Guard District Commander sustain the Officer in Charge, Marine Inspection, the manufacturer may appeal to the Commandant. The decision of the Commandant shall be final.

§ 52.01-25 *Certifications and affidavits of manufacturers*.¹ (a) In requesting inspection of a new boiler or pressure vessel subject to inspection by the Coast Guard, the manufacturer shall file with the Officer in Charge, Marine Inspection, a certification of a data report in triplicate on form CG 2935 for boilers or form CG 2936 for unfired pressure vessels. (See § 57.20-5 or 57.20-10 of this subchapter.)

(b) Manufacturers of class B materials, such as pipe, valves, flanges, fittings, traps, separators, casting, forgings, etc., or appliances, proposed for use on vessels subject to inspection by the Coast Guard, shall file at Headquarters affidavits duly executed on form CG 935A certifying that such materials or appliances will be manufactured in accordance with the regulations in this subchapter. (See § 57.20-15 of this subchapter.)

¹ For description of forms, see Subpart 57.20.

§ 52.01-30 *Certification required for duplicate boilers.* A manufacturer desiring to construct any boiler or pressure vessel which is identical with a boiler or pressure vessel previously approved by the Officer in Charge, Marine Inspection, shall not be required to resubmit drawings, but shall submit to the Officer in Charge, Marine Inspection, a certificate that the proposed boiler or pressure vessel conforms in every respect with drawings previously approved. Such certificate shall contain the boiler or pressure vessel number, the drawing number or numbers, and the date of approval. If, upon examination, the Officer in Charge, Marine Inspection, ascertains that the said approved drawings meet the requirements specified in § 52.01-15, the manufacture of such boiler or pressure vessel shall be authorized. In case of disapproval of the request by the Officer in Charge, Marine Inspection, the manufacturer shall have the right of appeal, as specified in § 52.01-20.

§ 52.01-35 *Auxiliary, donkey, low-pressure, and hot-water boilers.* (a) All auxiliary and donkey boilers shall be designed, constructed, installed, and inspected in accordance with the requirements specified in this subchapter for main boilers, and shall be subject to the same initial procedure and general requirements.

(b) Low-pressure steam boilers used exclusively for heating, and hot-water boilers used exclusively for heating or for hot-water supply, the maximum allowable pressure of which does not exceed 30 pounds per square inch, shall conform to the requirements of Part 53 of this subchapter. Boilers of this type, the maximum allowable pressure of which exceeds 30 pounds per square inch, shall conform to the requirements specified in this subchapter for main boilers.

§ 52.01-40 *Materials and workmanship.* All materials to be used in any of the work specified in the various sections of this part shall be free from injurious defects and shall have a workmanlike finish. The construction work shall be executed in a workmanlike manner with proper tools or equipment and shall be free from defects which would impair strength or durability.

§ 52.01-45 *Inspection of boilers under construction.* (a) When one or more boilers are under construction, manufacturers shall allow inspectors access to such boilers at such times as the inspectors shall deem necessary; and it shall be the duty of the inspectors to determine by actual observation or measurements that the boilers are being constructed in all respects in accordance with the approved design, and that the workmanship is good. The inspectors shall make a record of the marks on the plates or furnaces which are being assembled in the boilers, which record shall be filed with the computations referred to in § 52.01-10.

(b) Where boilers or pressure vessels are constructed in one inspection district for installation on a vessel in another inspection district, the Officer in Charge, Marine Inspection, in the former district shall, upon request of the Officer

in Charge, Marine Inspection, in the latter district, examine and report on such boilers or pressure vessels and ascertain that the proper materials are being used, and that the workmanship is good. The inspectors' report shall include a record of the markings on plates and furnaces and shall be filed with the record of inspection in the district where the boilers or pressure vessels are to be installed.

§ 52.01-50 *Boilers or pressure vessels of foreign vessels.* (a) Boilers or pressure vessels of foreign vessels admitted to American registry shall be inspected in the same manner as boilers on American vessels. The hydrostatic test of such boilers or pressure vessels shall be one and one-half times the maximum allowable pressure under which they have been operated at the first United States inspection.

(b) This allowable pressure shall be accepted as the basis for determining the maximum allowable pressure where it is not practicable or possible to secure a record of the tests of the plates that entered into the construction of the boiler or pressure vessel. The Officer in Charge, Marine Inspection, may reduce the maximum allowable pressure if deemed necessary after a close examination of the general conditions or design of the boiler or pressure vessel.

§ 52.01-55 *Foreign-built pressure vessels.* For inspection and test of unfired pressure vessels manufactured in foreign countries, see § 54.01-50 of this subchapter.

§ 52.01-60 *Alternative materials or methods of construction.* If, in the development of industrial arts, improved materials or methods of construction are developed, their use in lieu of those specified will be given consideration upon formal application to the Commandant, with full information as to their characteristics, together with such scientific data and evidence as may be necessary to establish the suitability of such materials or methods of construction for the purpose intended.

§ 52.01-65 *Repairs, replacements, or alterations.* No repairs, replacements, or alterations, except emergency repairs, etc., shall be made to boilers, pressure vessels, their mountings or internal fittings, safety valves, piping systems, or pressure appliances without prior approval by the Officer in Charge, Marine Inspection. In the case of vessels built subsequent to the adoption¹ of the regulations in this subchapter, repairs, replacements, or alterations shall so far as practicable be made with materials and in the manner specified for new construction. Boilers built and installed prior to the adoption of the regulations in this subchapter may be repaired with materials and in the manner specified for new construction in the regulations existing at the time the boilers were constructed, except that the use of cast iron valves, mountings or attachments for repairs, replacements, or alterations on existing boilers and steam lines operating at pressures exceeding 30 pounds per square

¹ These regulations are in effect on and after July 1, 1948.

inch is prohibited. Emergency repairs, replacements, or alterations shall be reported as soon as practicable to the Officer in Charge, Marine Inspection, in the first inspection district where the vessel may call after such repairs are made.

§ 52.01-70 *Experimental determination of pressure rating.* Where approval is requested for a boiler structure, pressure vessel or any part thereof which, due to its irregular form, process of manufacture, or for any other reason, becomes a new or difficult subject of accurate mathematical analysis, the Commandant may require a full-size specimen to be furnished for the purpose of making any tests which he may consider necessary to determine a safe and fair pressure rating for such pressure vessel or pressure part.

§ 52.01-75 *Inspectors' decisions.* When it becomes necessary for inspectors to make decisions on certain matters covered by the regulations in this subchapter, they shall in making their reports quote the section and paragraph number on which their decisions are based. Whenever it is necessary to make decisions in matters not specifically covered by the regulations in this subchapter, they shall in making their reports state clearly the reasons which caused them to arrive at such decisions.

§ 52.01-80 *Boilers on barges.* Boilers on existing barges required to be inspected and not constructed according to the specifications prescribed by the Commandant may be considered the same as foreign-built boilers as specified in § 52.01-50, and so treated.

§ 52.01-85 *Alternative procedures to govern new designs or methods of construction.* When new procedures, designs, or methods of construction are submitted for approval, the Commandant is authorized to act regarding the approval or disapproval of such new developments for which no regulations have been provided.

SUBPART 52.05—CYLINDRICAL SHELLS

§ 52.05-1 *Definitions.*—(a) *Cylindrical shell.* The term "cylindrical shell," as used in the regulations in this subchapter means the cylinder forming the outer envelope of a boiler or other pressure vessel, or of a drum which is a part of a boiler consisting of one or more plates properly riveted, welded, or otherwise joined or of seamless construction as hereinafter specified. (This does not include curved tube sheets set forth in subpart 52.40.)

(b) *Course.* A course is a section of a cylindrical shell which comes between circumferential joints.

§ 52.05-5 *Materials.* (a) Steel plates used for cylindrical shells shall be of marine boiler steel conforming to the requirements of subpart 51.04, except, that cylindrical shells of riveted construction not subject to the radiant heat of the fire and designed for allowable pressures not exceeding 150 pounds per square inch, may be constructed of steel plates meeting the specifications of subpart 51.22, and which are tested, inspected, and stamped in accordance with § 51.01-1 of this subchapter.

(b) Boiler shells may be of seamless construction in accordance with requirements of § 52.05-15. Boiler shells not exceeding 18 inches in diameter may be fabricated of electric-resistance butt-welded pipe in accordance with § 52.05-20.

§ 52.05-10 *Computations and factors of safety.* (a) Cylindrical shells shall be in accordance with the following relations of pressure and thickness, provided that shell plates for boilers shall not be less than 1/4 inch thick. Where the thickness of the shell does not exceed 10 percent of the inside radius, formula (1) or (2) shall be used; where the thickness exceeds 10 percent of the inside radius formula (3) may be used.

$$P = \frac{STE}{RF} \quad (1)$$

$$T = \frac{PRF}{SE} \quad (2)$$

$$P = \frac{SE}{F} \frac{(R_o^2 - R^2)}{(R_o^2 + R^2)} \quad (3)$$

where:

P=maximum allowable pressure in pounds per square inch.

S=minimum of the range of tensile strength of the shell material in pounds per square inch.

T=minimum thickness of the shell in inches.

R=inside radius of the shell in inches.

R_o=outside radius of the shell in inches.

E=minimum efficiency of the longitudinal joint (or relative strength of ligament between tube holes or other openings, whichever is least). (See paragraph (b) and §§ 52.05-15 to 52.05-25, inclusive, 52.10-10, 52.35-15 (g), and 52.40-5.)

F=Factor of safety, which shall not be less than the following:

4.0 for shells, not exposed to fire or products of combustion, which are seamless forged or have riveted double butt strap longitudinal joints.

4.25 for steam or water drums of seamless steel pipe or electric-resistance butt welded pipe not exceeding 18 inches in diameter not exposed to fire or products of combustion, and for water drums of water tube boilers, other than arc or gas welded water drums.

4.5 for shells of the above-mentioned types, except water drums of water tube boilers, which are exposed to fire or the products of combustion whether bare or covered with heat-resisting material; also for arc or gas welded drums for all purposes.

5.0 for shells of brazed construction.

10.0 for cast steel for shells of unfired pressure vessels where the thickness is not less than 3/16 inch and does not exceed 2 inches.

12.0 for cast iron for shells of unfired pressure vessels where the pressure does not exceed 30 pounds per square inch and the thickness is not less than 1/4 inch.

(b) The efficiency factor E for riveted joints and for ligaments between tube holes or other openings shall be calculated as set forth in § 52.10-10 (c). For other than riveted joints, the applicable values of E listed below shall be used in the above formulas:

1.0 for seamless shells.

0.9 for class I arc or gas welded shells (§ 56.01-25), and for brazed unfired pressure vessels (subpart 56.10).

0.8 for class II arc or gas welded shells (§ 56.01-30).

0.7 for shells of electric-resistance butt welded pipe.

0.65 for class III arc or gas welded shells (§ 56.01-35) not less than 1/4 inch thick where the longitudinal joint is of the double welded butt type.

0.55 for class III arc or gas welded shells where the longitudinal joint is of the single welded butt or double welded lap type.

§ 52.05-15 *Seamless shells.* Shells may be of seamless construction with or without integral heads, provided the material conforms to the requirements of subpart 51.34 or 51.37 of this subchapter for seamless pipe. In such cases, the value of E in the formula (1), (2), or (3) in § 52.05-10 shall be taken as 1.0.

§ 52.05-20 *Electric-resistance butt welded shells.* Shells not exceeding 18 inches in diameter may be fabricated of electric-resistance butt welded pipe made of open-hearth or electric-furnace steel, as specified in subpart 51.37 or 51.40 of this subchapter. The maximum allowable pressure and minimum thickness of the shells shall be computed by formulas (1) and (2), or (3) in § 52.05-10, using 0.7 as the value of E. Holes for tubes, nozzles, or other openings shall not be drilled in the weld.

§ 52.05-25 *Cylindrical shells pierced for tubes.* (a) Where cylindrical shells are pierced by a single line of tubes, or by two or more lines well apart, the maximum allowable pressure and minimum thickness shall be determined by formula (1), (2), or (3) in § 52.05-10. For tube lines other than those placed on the longitudinal joint, the shell shall, if necessary, be either reinforced or thickened.

(b) The relative strength of the ligaments between tube holes which come in a single line in a butt-strap joint or reinforced shell, shall be computed by the following formula:

$$E = \frac{(p-d)T_1}{pT} \quad (1)$$

where:

E=relative strength of ligament. (See § 52.05-10.)

p=pitch of tubes, in inches. (For minimum width of ligament, see subpart 52.40.)

d=diameter of tube holes, in inches.

T=thickness of shell, in inches.

T₁=the aggregate thickness of the two butt straps, or the shell and reinforcing plate, in inches.

(c) Reinforcing plates used to strengthen the shell where pierced for tubes shall be riveted to the shell. Inside of the calking edge, the spacing of the rivets shall be determined as for stays for flat surfaces, as specified in subparts 52.30 and 52.35. The shearing strength of the rivets securing the reinforcing plate on each side of the tube line shall be at least equal to the required strength of the ligament of the reinforcing plate between the tubes.

§ 52.05-30 *Externally fired boilers.* The thickness of shell plates of externally fired boilers shall not exceed 0.45 inch.

¹Where nests of tubes are grouped together, as in drums of certain types of water-tube boilers, the plate shall be treated as a curved tube sheet, as hereinafter defined in subpart 52.40.

SUBPART 52.10—SHELL JOINTS

§ 52.10-1 *Approved types of joints.*

(a) Joints of shells of boilers or other pressure vessels are classified as follows:

(1) Riveted joints, which may be either lapped or butt-strap.

(2) Welded joints, which shall be made by the hammer-weld or other approved process.

§ 52.10-5 *Materials and workmanship.*

(a) The butt straps of riveted joints shall be of steel conforming with the specifications and requirements for the shell plates.

(b) Rivets shall conform to the requirements of Part 51, as follows:

Steel rivets..... Subpart 51.16
Iron rivets..... Subpart 51.19

(c) Rivet holes shall be drilled wholly and fairly, preferably in position. After drilling, plates and straps shall be disassembled, burrs removed, and edges of holes faired before the plates are riveted together. Drifting of rivet holes is prohibited.

(d) The edges of all plates and straps of riveted joints shall be machined for calking and shall be beveled to an angle of approximately 70° to the plane of the plate and burrs removed. The material removed in machining the edges shall not be less than one-fourth of the thickness of the plate and shall in no case be less than 1/8 inch.

(e) Plates and straps shall be so closely fitted, metal to metal, as to require a minimum of calking to obtain tightness. Split calking is prohibited.

§ 52.10-10 *Longitudinal riveted joints and computations.* (a) The longitudinal joints of drums and shells of all boilers the contract for construction of which is signed on or after March 1, 1941, shall be of riveted double-butt strap construction, at least double-riveted.

(b) The longitudinal joints of externally fired fire-tube or flue boilers shall be located above the fire line of the setting.

(c) The efficiency of riveted joints is the ratio which the strength of the joint bears to the strength of the solid plate. The efficiency of a riveted joint is determined by calculating the breaking strength of a unit section of the joint, considering each possible mode of failure separately, and dividing the lowest result by the breaking strength of the solid plate of a length equal to that of the section considered. It shall be computed in accordance with the following formulas:

(1) For plate section:

$$E = \frac{P-d}{P} \quad (1)$$

(2) For rivet section:

$$E = \frac{Nas}{PST} \quad (2)$$

(3) For combined efficiency of plate in second row and shearing strength of rivet in outer row:

$$E = \frac{P-d}{P} + \frac{nas}{PST} \quad (3)$$

¹It is assumed that the joints are of the usual construction where the rivets are symmetrically spaced.

(4) For combined efficiency of plate in second row and crushing strength of butt strap in front of rivet in outer row:

$$E = \frac{p-d}{p} + \frac{ncdt}{PST} \quad (4)$$

where:

E = efficiency of riveted joint in ratio to solid plate.

P = pitch in inches of rivets in outer row.

p = pitch in inches of rivets in second row.

d = diameter of rivet hole, in inches.

N = total number of rivets per pitch P .

n = number of rivets in outer row per pitch P .

T = thickness of shell plate, in inches.

t = thickness of butt strap, in inches.

a = sectional area of the driven rivet, in square inches.

c = crushing strength of plate in front of rivets. (Assumed as 95,000 pounds per square inch.)

S = tensile strength of plate in pounds per square inch.

s = shearing strength of rivets in pounds per square inch of sectional area, assumed as follows:

Iron rivets in single shear.....	38,000
Iron rivets in double shear.....	76,000
Steel rivets, grade A, in single shear.....	44,000
Steel rivets, grade A, in double shear.....	88,000
Steel rivets, grade B, in single shear.....	52,000
Steel rivets, grade B, in double shear.....	104,000
Alloy-steel rivets, grade C, in single shear.....	60,000
Alloy-steel rivets, grade C, in double shear.....	120,000

(d) The maximum allowable pitch of rivets in longitudinal joints shall be such as to insure good caulking.

(e) The distance between the center lines of any two adjacent rows of rivets, or the "back pitch," measured at right angles to the direction of the joint, shall in no case be less than twice the diameter of the rivet hole. The "back pitch" of the rivets shall be measured either on the flat plate before rolling or on the middle line of the plate after rolling. The diagonal ligaments between staggered rivets shall have the proper strength as determined by figure 52.40-5 (f2).

(f) On longitudinal joints, the distance from the center of the rivet holes to the caulking edge of the plate before caulking, except rivet holes in the ends of butt straps, shall be not less than one and one-half and not more than one and three-fourths times the diameter of the rivet holes.

(g) Where the drums of water-tube boilers are pierced through the longitudinal butt-strap joint for the purpose of inserting tubes to connect the headers to the drum, the combined thickness of both butt straps shall be taken in computing the efficiency of the ligament between tube holes. This efficiency shall in no case be less than that required for the riveted joint.

§ 52.10-15 Butt straps and computations. (a) The thickness of butt straps shall be such as to permit efficient caulking of the edges. Where the pitch of the rivets is so great as to make effective caulking doubtful, as occurs in quadruple riveting, the edge should be scalloped around the outer rivets.

(b) The thickness of the outer butt strap shall be not less than that deter-

mined by the following formula, but it shall in no case be less than $\frac{1}{4}$ inch:

$$t = \frac{5T(P-d)}{8(P-Kd)} \quad (1)$$

where:

t = thickness of outer strap, in inches.

T = required thickness of shell plate, in inches.

P = pitch of rivets in outer rows, in inches.

d = diameter of rivet holes, in inches.

K = ratio of pitch of rivets in outer row to minimum pitch in inner rows.

(c) The thickness of the inner butt strap shall equal t plus 0.125 inch, but is not required to exceed the thickness of the shell plate.

(d) The thickness of butt straps on drums of water-tube boilers pierced for the purpose of inserting tubes to connect the headers to the drums, shall be increased if necessary to maintain the efficiency on which the allowable pressure is based.

(e) Butt straps shall be formed to the curvature of the shell by rolling or pressing.

§ 52.10-20 Circumferential joints.

(a) The minimum strength of circumferential joints attaching shells to heads of boilers or other pressure vessels shall bear the following ratios to that required for the longitudinal joints of the shell:

(1) Fifty percent when no part of the load on the head is supported by either tubes or stays.

(2) Forty percent when one-half or more of the load on the head is sustained by stay tubes, flues, or stays; except that circumferential head joints of externally fired fire-tube or flue boilers exposed to fire or to the products of combustion, shall have a minimum strength of not less than 50 percent of that of the longitudinal joint.

(b) The strength of the circumferential joints connecting courses of the shell shall be not less than 75 percent of that required for the longitudinal joints of the shell except that in the case of externally fired flue boilers the strength of circumferential joints need not exceed 60 percent of the strength of the longitudinal joint.

(c) Circumferential end joints of shell plates over $\frac{5}{8}$ inch thick and circumferential joints connecting courses of shells, the required thickness of which is over $\frac{1}{2}$ inch, shall be at least double riveted. Where the thickness of the shell plate exceeds $1\frac{1}{8}$ inches for single-ended boilers, and $1\frac{3}{16}$ inches for double-ended boilers, the circumferential seams connecting shell courses shall be triple riveted.

(d) The distance from the centers of rivet holes of circumferential joints to the caulking edges of the plate shall not be less than one and one-half times the diameter of the rivet holes.

§ 52.10-25 Welded joints. (a) Welded joints shall be as specified in § 52.05-20 or Part 56 of this subchapter.

(b) Arc or gas welding shall be allowed in the construction of boilers and other pressure vessels for the purpose of securing tightness in parts of riveted joints which are otherwise constructed

fully in accordance with the regulations in this subchapter.

SUBPART 52.15—DOMES AND STEAM CHIMNEYS

§ 52.15-1 Definitions—(a) Domes.

Domes are superstructures of shells, attached by riveting or other approved means. They generally consist of a cylindrical shell with one end flanged for attachment to the main shell and the other end closed by a head which may be integral with, riveted or welded to the shell. The diameter of the dome shall not exceed one-half of the diameter of the shell.

(b) *Steam chimneys.* Steam chimneys are superstructures of steam boilers which are fitted with a lining inside of which the products of combustion pass to the smokestack. They may be constructed in the form of a dome integral with the boiler or as independent steam vessels connected by piping to the boiler.

§ 52.15-5 Materials and workmanship.

(a) Steel plates used in the construction of domes shall conform to the specifications and requirements for the shell plates. For steam chimneys the steel plates used shall conform to the specifications and requirements of subpart 51.04 or 51.22, and which are tested, inspected, and stamped in accordance with § 51.01-1 of this subchapter.

(b) Rivets shall conform to the requirements of Part 51 as follows:

Steel rivets.....	Subpart 51.16
Iron rivets.....	Subpart 51.19

§ 52.15-10 Computations.

(a) The maximum allowable pressure on the shell of domes and steam chimneys or the minimum thickness of shell required for any given allowable pressure, also the efficiency of riveted joints, shall be computed as specified for cylindrical shells and joints in subparts 52.05 and 52.10.

(b) Flat surfaces of heads of domes and steam chimneys shall be stayed as specified for surfaces to be stayed or reinforced in subparts 52.30 and 52.35.

(c) The maximum allowable pressure on unstayed steam chimney linings, or the minimum thickness of such linings, shall depend upon their type and shall be computed in accordance with the requirements for furnaces and flues specified in subpart 52.50.

(d) A cylindrical surface exposed to external pressure and not entirely self-supporting shall be stayed in accordance with the requirements of subparts 52.30 and 52.35, specifically § 52.30-10 (g).

(e) The strength of the rivets and of ligaments between rivets in the flange attaching a dome or steam chimney to a main shell shall be sufficient to give a factor of safety of not less than six against the full load acting on the head. This factor of safety may be reduced to not less than four when not less than 50 percent of the load on the head is carried by stays secured to the main shell.

§ 52.15-15 Steam chimney fittings.

Drain pipes shall be fitted to steam chimneys in which water is likely to collect. Steam chimneys that are arranged to be disconnected from main boilers shall be provided with a safety valve not less than

2½ inches in diameter and with a steam gauge and shall be provided with man-holes to enable inspectors to make a proper examination of the interior.

SUBPART 52.20—HEADS

§ 52.20-1 *Definitions*—(a) *Unstayed heads*. Unstayed heads are the ends of a pressure vessel shell. They may be either flat or dished. Heads may be integral with, riveted, welded, or brazed to the shell.

(b) *Unstayed flat heads*. Unstayed flat heads may be used to close shells as permitted by § 52.20-10.

(c) *Dished heads*. Dished heads may be of circular or elliptical section and may be attached to the shell so that the pressure will be either on the concave or on the convex surface.

(d) *Stayed heads*. Stayed heads are heads supported in whole or in part by stays, furnaces, flues, tubes, etc.

§ 52.20-5 *Materials and workmanship*. (a) Steel plate used in the fabrication of heads shall be either flange or firebox quality complying with the applicable sections of the regulations. Flanged or dished heads for class I or class II pressure vessels, except those exempted in note below, shall, after forming, be stress-relieved in accordance with § 56.01-70 of this subchapter, even though the entire vessel is not required to be stress-relieved.

Note: It is not mandatory in fresh and salt water service systems that flanged or dished heads be stress-relieved for use on compression tanks with an air cushion con-

taining liquids operating at temperatures not exceeding 212° F.

(b) The inside radius of the bend of the flange formed on any head for attachment to the shell shall be not less than three times the thickness of the head and shall in no case be less than 6 percent of the diameter of the shell for unstayed heads.

(c) Dished heads having the pressure on the convex side shall be formed to a true surface without flats.

(d) The heads here considered are of steel plate. Cast-steel heads may be used for pressure vessels other than boilers, but only where specifically authorized by the Commandant.

(e) The edge of the flange formed on a head shall be machined to a true surface. Where the flange is to be calked

inside, the edge shall be beveled as specified for the edges of plates and straps in § 52.10-50. Care shall be taken in calking to avoid damaging the surface of the plate.

(f) The holes for rivets to attach the head to the shell shall, as far as practicable, be drilled in position, and the shell and head shall be taken apart after the holes are drilled, and burrs removed. In cases where holes cannot be drilled in position, the holes shall be examined after assembly and faired by reaming where necessary. (The requirements to take apart shell and head for removing burrs shall not apply to heads where the contact surfaces have been machined and the heads shrunk in place.)

§ 52.20-10 *Computations*—(a) *Flat heads*. The maximum allowable pres-

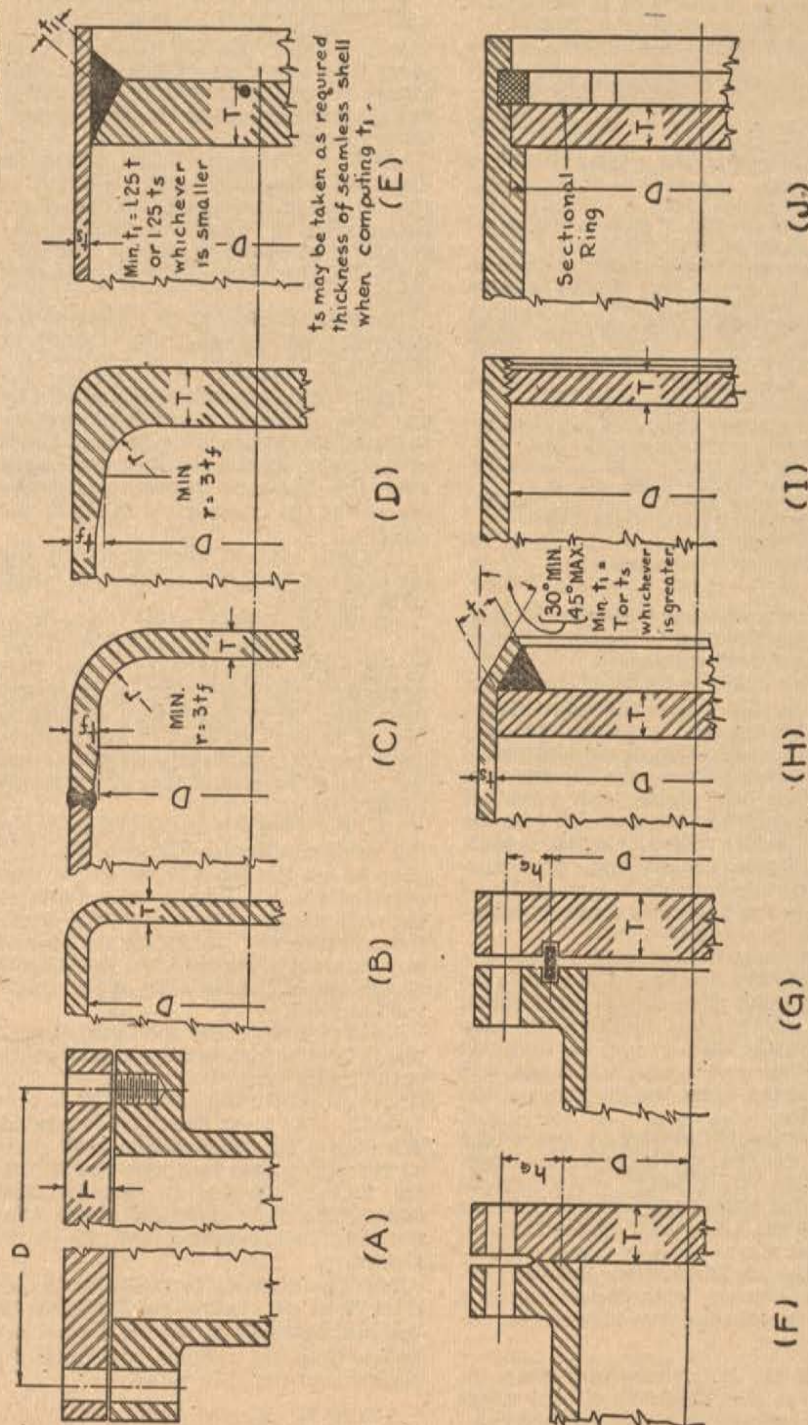


FIGURE 52.20-10—Acceptable types of flat heads and covers.

sure and minimum required thickness of unstayed flat heads, cover plates, blind flanges, etc., shall be determined by the following formulas:

$$P = \frac{ST^2}{CD^2} \quad (1)$$

$$T = D \sqrt{\frac{CP}{S}} \quad (2)$$

where:

D =diameter, or shortest span, measured as indicated in figure 52.20-10, in inches.

P =maximum allowable pressure, in pounds per square inch.

T =minimum required thickness of plate, in inches.

S =minimum tensile strength of the heads, in pounds per square inch.

$C=0.81$ for plates rigidly riveted or bolted to shells, flanges, or side plates, as shown in figure 52.20-10 (A); and for integral flat heads as shown in figure 52.20-10 (B) where dimension D does not exceed 24 inches and the ratio of thickness of the head to dimension D is at least equal to or greater than 0.05.

$C=1.25$ for heads forged integral with or butt-welded to shells, pipes, or headers as shown in figures 52.20-10 (C) and (D), where the corner radius on the inside is not less than three times the thickness of the flange immediately adjacent thereto, and where the welding meets all the requirements for circumferential joints given in part 56, including stress relieving and radiographic examination.

$C=2.50$ for plates arc or gas welded to the inside of pipes or headers and otherwise meeting the requirements for respective type of arc or gas welded vessel, including stress relieving but omitting radiographic examination. The plate shall be welded its entire thickness as shown in figure 52.20-10 (E), with a fillet weld having a throat not less than one and one-fourth times the thickness of shell or flat head, whichever is smaller.

$$C = 1.50 + \frac{7.00 W h_g}{HD} \text{ for plates bolted to}$$

shells, flanges, or side plates, in such a manner that the setting of the bolts tends to dish the plate, and where the pressure is on the same side of the plate as the bolting flange, as shown in figures 52.20-10 (F) and (G).

where:

W =flange design bolt load, in pounds.

h_g =radial distance from the bolt-circle diameter to the diameter D , in inches.

H =total hydrostatic end force on area bounded by the outside diameter of the gasket or contact surface, in pounds.

D =diameter, or shortest span, measured as indicated in figure 52.20-10, in inches.

$C=2.50$ for plates having a dimension D not exceeding 18 inches inserted into pressure vessels and welded thereto as shown in figure 52.20-10 (H), and otherwise meeting the requirements for the respective type of class II welding including stress relieving but omitting radiographic examination. The end of the pressure vessels shall be crimped over to an angle not less than 30° nor more than 45°. The throat of the weld shall not be less than the thickness of the pressure vessel or flat head, whichever is greater.

$C=3.75$ for plates screwed into the end of a pressure vessel having an inside diameter D not exceeding 12 inches, as shown in figure 52.20-10 (I), or for heads having an integral flange screwed over the end of a pressure vessel having an inside diameter D not exceeding 12 inches. The design of the threaded joint against failure by shear, tension, or compression resulting from the end force due to pressure shall be based on a factor of safety of at least 5 and the threaded parts are at least as strong as the threads for standard piping of the same diameter, and the head shall be welded to the pressure vessel by means of a seal weld.

$C=1.50$ for plates inserted into the ends of pressure vessels and held in place as shown in figure 52.20-10 (J) where all possible means of failure, either by shear, tension, or compression, due to the hydrostatic end force, are resisted with a factor of safety of 5. Seal welding may be used, if desired.

(b) *Dished heads.* (1) The maximum allowable pressure and thickness of an unstayed dished head, without manhole or handholes, with the pressure on the concave side shall be calculated by the following formulas:

$$P = \frac{2ST}{RF} \quad (3)$$

$$T = \frac{PRF}{2S} \quad (4)$$

where:

P =maximum allowable pressure, in pounds per square inch.

T =minimum thickness of plate, in inches.

S =minimum tensile strength of the material, in pounds per square inch.

R =radius in inches to which the head is dished, measured on the concave side of the head. Where two radii are used, the longer shall be taken as R .

$F=8.33$ for a plate head.

$F=10.0$ for a cast steel head.

$F=12.0$ for a cast iron head.

(2) Where the radius R , to which the head is dished is less than 80 percent of the inside diameter of the shell, the value of R used in the formula shall be at least 80 percent of the diameter of the shell.

§ 52.20-15 *Detail requirements*—(a) *Openings in flatheads.* (1) Unreinforced openings in unstayed flat heads shall be calculated in accordance with § 52.25-15 (a). For the calculated thickness T use formula (2) of § 52.20-10 (a) and employ the outside diameter of the shell D in this formula. For K use the ratio of thickness T obtained as above to actual thickness of the flat plate.

(2) Reinforced openings in unstayed flat heads, where the maximum diameter of the opening does not exceed 50 percent of the maximum allowable diameter of unreinforced opening d , shall be designed in accordance with § 52.25-20 where T is the thickness of the shell required by formula (1) of § 52.25-15 (a), except that the required cross section need only be 75 percent of that specified in § 52.25-20.

(3) Where the maximum diameter of an opening exceeds 50 percent of dimension D , the flat plate shall be designed as a flange.

(b) *Dished heads.* (1) The radius to which the head is dished shall not be

greater than the diameter of the shell to which the head is attached. This will apply to the longer radius where two radii are used.

(2) A circular head without manhole or handholes which is of a semi-elliptical section in which half the minor axis (or the depth of the head not including the flange) is at least equal to one-fourth of the inside diameter of the head, shall be made at least as thick as the required thickness of a seamless shell of the same diameter.

(3) When dished heads are of lesser thickness than called for by formula (4) in § 52.20-10, and as modified by the preceding paragraphs, they shall be stayed. The stays shall be designed to carry the excess pressure on the projected area of the head over that considered in formula (3) of § 52.20-10.

(4) If a dished head is formed with a flattened spot or surface, the diameter of the flat spot shall not exceed that allowed for flat heads as given by formulas (1) and (2) of § 52.20-10 and the minimum thickness shall be computed by these formulas, using $C=2.0$.

(5) The maximum allowable pressure and the minimum thickness of an unstayed dished head without manhole or handholes with the pressure on the convex side shall be calculated by formulas (3) and (4) of § 52.20-10, the maximum allowable pressure thus determined shall be allowed.

(6) The maximum allowable pressure and minimum thickness of dished cast-steel heads, where permitted, shall be calculated by formulas (3) and (4) of § 52.20-10.

(7) When a dished head has a flanged-in manhole or other access opening exceeding 6 inches in any dimension, the thickness of the head shall be increased by not less than 15 percent of the required thickness for a head computed by formula (4) of § 52.20-10 but in no case by less than $\frac{1}{8}$ inch. Such manholes or other access openings shall be flanged inwards to a minimum radius measured on the inside of the plate of not less than $\frac{1}{8}$ inch for plates up to and including $1\frac{1}{2}$ inches in thickness and for plates exceeding $1\frac{1}{2}$ inches thickness the radius shall be increased proportionately. The minimum depth of the flange measured from the outside of the plate at the ends of the major axis shall be determined by the following formula:

$$d = \sqrt{T w} \quad (1)$$

where:

d =depth of flange, measured from the outer face, in inches.

T =thickness of the plate, in inches.

w =minor axis of the opening, in inches.

(8) If more than one manhole or access opening is inserted in the head, the thickness of which is calculated by this regulation, the minimum distance between the openings shall be not less than one-fourth of the outside diameter of the head.

(9) Where a dished head has a flanged opening supported by an attached flue, an increase in thickness over that computed by formula (4) of § 52.20-10 is not required.

(10) All other openings which require reinforcement placed in an unstayed

dished head or an ellipsoidal head, including all types of manholes, except those of the integral flanged-in type, shall be reinforced in accordance with § 52.25-20, in the application of which the head shall be treated as a shell of the same diameter, thickness, allowable pressure, and material; and, when so reinforced, the thickness of an unstayed dished head may be the same as for a blank unstayed dished head, and the thickness of an ellipsoidal head may be the same as for a blank ellipsoidal head.

(c) *Unreinforced openings in dished heads.* Unreinforced openings in dished heads shall be governed by the following:

(1) The edge of any unreinforced opening, excluding rivet holes, shall come no closer to the line bounding the spherical or ellipsoidal portion of the head around a manhole than the distance equal to the thickness of the head, and in no case, except for water-column connections, shall it come within the part formed by the corner radius of a dished head.

(2) The maximum allowable diameter of any unreinforced opening in a head shall not exceed that permitted by § 52.25-15 (a) for a shell of the same diameter, thickness, allowable pressure and material, nor shall it exceed 8 inches in any case.

(3) The minimum distance between the centers of any two unreinforced openings, rivet holes excepted, shall be determined by the following formula:

$$L = \frac{A+B}{2(1-K)} \quad (2)$$

where:

L —distance between the centers of the two openings, measured on the surface of the head, in inches,

A and B —diameters of the two openings, in inches,

K —same as defined in § 52.25-15 (a) for the equivalent shell described in paragraph (c) (2) of this section.

SUBPART 52.25—OPENINGS AND REINFORCEMENTS

§ 52.25-1 *Definitions*—(a) *Openings.* Openings, as defined in this subpart, are holes cut in shells or heads of boilers or other pressure vessels, including domes and steam chimneys, for the purpose of construction, inspection, and cleaning. They may or may not require reinforcement.

NOTE: Openings in the shells or heads of boilers or other pressure vessels, including domes and steam chimneys, for other purposes than above defined (such as pipe connections and mountings) are defined and necessary reinforcement is specified in § 52.25-20. For maximum diameter not requiring reinforcement, see figures 52.25-15 (b1) and 52.25-15 (b2).

(b) *Manholes.* Manholes shall be of elliptical form, the dimensions of which shall be not less than 10 by 16 inches or 11 by 15 inches. The size 12 by 16 inches should be used wherever practicable. Circular manholes having diameters of 15 inches may be permitted.

(c) *Handholes.* Handholes may be of circular or elliptical form. The diameter of a circular handhole or the minor axis of an elliptical handhole shall be not less than 4 inches. This requirement does not apply to small access openings such as used in superheater headers.

(d) *Inspection openings.* Inspection openings smaller than specified for handholes are permissible where a handhole opening is impracticable.

§ 52.25-5 *Detail requirements.* (a) where elliptical openings are made in the shell of a boiler or other pressure vessel, the minor axis shall, as far as practicable, be placed longitudinally.

(b) All manholes, handholes, and inspection openings shall be closed by readily removable internal cover plates which shall be held by one or more girders or dogs and bolts. The cover plates shall be formed with a projection to fit within the opening with a radial clearance not exceeding $\frac{1}{16}$ inch at any point. This projection may be in form of a raised face which shall protrude straight out from the joint face within the opening not less than $\frac{1}{2}$ inch on manholes or $\frac{3}{8}$ inch on smaller cover plates.

(c) Externally fired boilers shall be fitted with a manhole opening in the lower front head beneath the flues. The minimum dimensions of such opening shall be 10 inches on the minor axis and 16 inches on the major axis. When shells are less than 46 inches in diameter, handholes 4 by 5 inches in size may be used in place of manholes.

§ 52.25-10 *Materials and workmanship.* (a) The material for reinforcing plates around openings shall conform to the requirements of the plate to be reinforced. When they are locally heated for flanging or forming, they shall be properly annealed.

(b) A forged nozzle or forged flange, riveted or welded to the plate, may be considered as reinforcement provided that such fittings are properly designed to compensate for the material removed.

(c) The cover plates for manholes shall be of steel conforming to the specifications and requirements for the shell plates. Handhole covers may be made of steel conforming to the specifications and requirements of the shell plates, or of steel conforming to the specifications of subpart 51.22, or of properly designed steel forgings conforming to the requirements of subpart 51.46, or of properly designed steel castings conforming to the requirements of subpart 51.58.

(d) Manhole and handhole girders or dogs may be steel or iron forgings, pressed steel, or steel castings of proper design.

(e) The material of bolts securing girders or dogs and cover plates shall conform to the requirements of subpart 51.07.

(f) Rivets used in securing reinforcing plates to the shell or other structural part shall conform to the requirements of subpart 51.16 or 51.19.

(g) The inner radius of the bend of any flanged opening in heads (except manholes or other access openings as specified in § 52.20-15 shall be: for furnace attachments, not less than twice the thickness of the plate flanged; for flue attachments in externally fired boilers, not less than one and one-half times the thickness of the plate flanged.

(h) The riveted joint of a reinforcing plate fitted to an opening in the shell or other part of a boiler or other pressure vessel, shall be properly calked along the edge of the opening and the outer edge of the reinforcing plate as specified in subpart 52.10 for riveted shell joints.

(i) When handhole or other access openings are made, a margin of not less than $\frac{1}{4}$ inch shall be left when punching operations are used, and not less than $\frac{1}{8}$ inch shall be left when machine burning methods are employed. Such margins shall be machined or ground away to relieve the metal of any stresses which may be set up due to burning or punching operations.

(j) The minimum width of bearing surface for a gasket on a manhole opening shall be $\frac{1}{2}$ inch. No gasket for use on a manhole or handhole of any boiler shall have a thickness greater than $\frac{1}{4}$ inch, when compressed.

§ 52.25-15 *Computations.* (a) An opening in a shell or drum shall be reinforced if any dimension of said opening exceeds 8 inches, or the value given by the following formula, whichever is the least:

$$d = 2.75 \sqrt{DT(1-K)} \quad (1)$$

$$K = \frac{PD}{2ST} \quad (2)$$

where:

d —maximum allowable diameter of unreinforced opening, in inches.

T —minimum thickness of shell plate, in inches.

P —maximum allowable pressure, in pounds per square inch.

D —outside diameter of drum or shell, in inches.

S —one-fifth of the minimum of the specified range of tensile strength of the shell plate, in pounds per square inch.

K —ratio of computed stress in the solid plate to one-fifth of the minimum of the specified range of tensile strength of the shell plate. Where the value of K equals or exceeds unity use 0.99.

(b) (1) The maximum diameter of unreinforced openings may be determined by use of diagrams, figures 52.25-15 (b1) and 52.25-15 (b2).

(2) To use the diagrams compute the value of (DT) and also the value of K as shown in the preceding formula (2). Next find on a diagram the vertical line corresponding to the (DT) value and follow this line vertically to the point where the line representing the K value intersects. By projecting this point horizontally to the left-hand edge of the diagram, the maximum diameter of an unreinforced opening may be read from the scale.

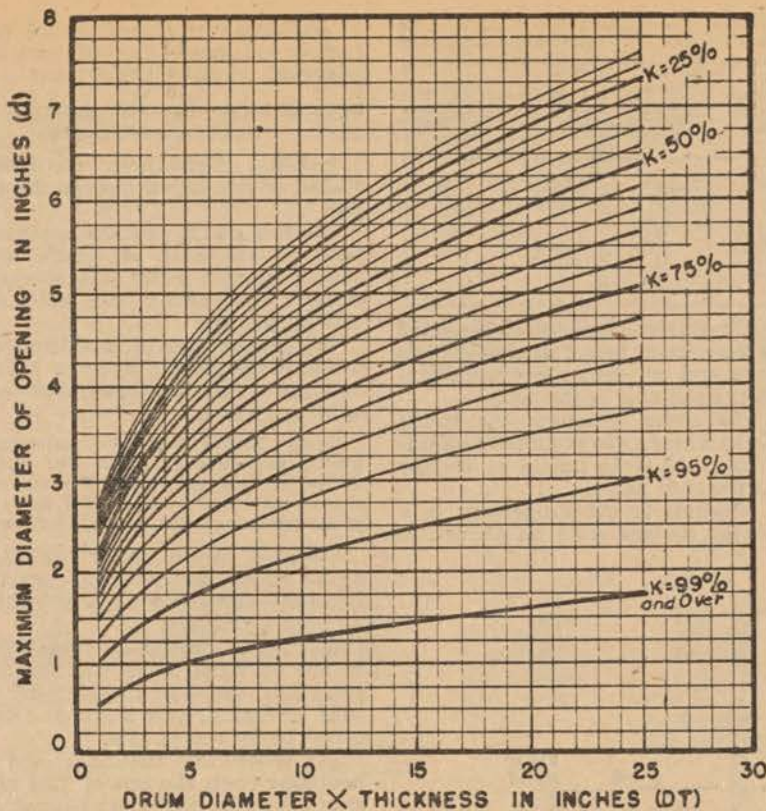


FIGURE 52.25-15 (b1)—Maximum diameter of unreinforced openings in shells.

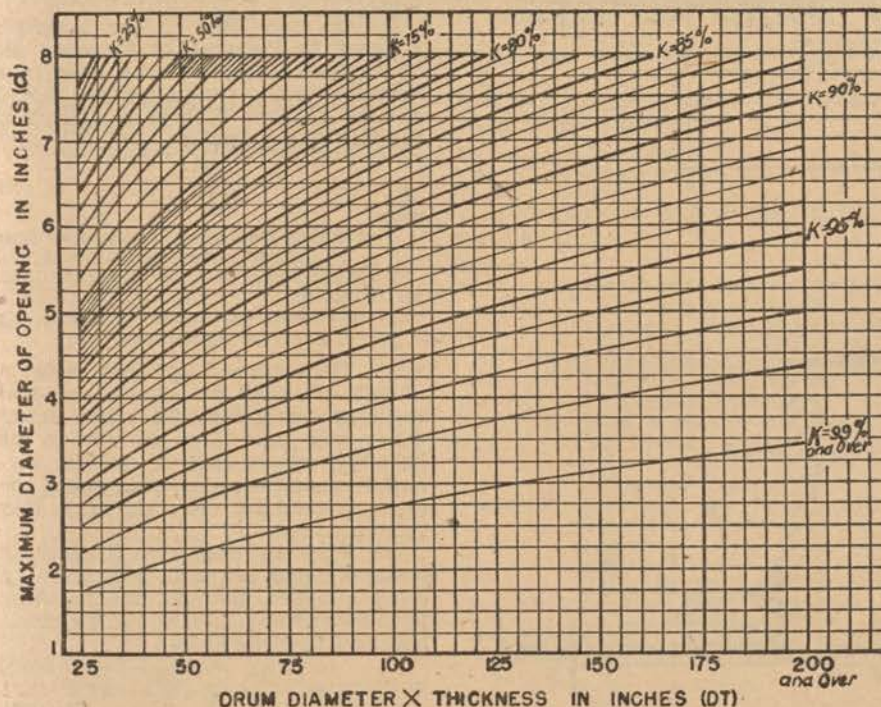


FIGURE 52.25-15 (b2)—Maximum diameter of unreinforced openings in shells.

§ 52.25-20 *Reinforced openings.* (a) An opening in a shell or drum with a diameter greater than the maximum unreinforced opening permitted by § 52.25-15 shall be provided with reinforcement. Openings of the reinforced type shall consist of one or more reinforcing rings or flanges riveted or welded to the shell and a nozzle or fitting welded

to the shell and/or welded to or integral with the reinforcing flange.

(b) (1) The thickness of a nozzle or fitting welded to the shell, reinforcing ring or flange shall be of a thickness of not less than extra heavy pipe for boilers and standard weight pipe for unfired pressure vessel and in no instance shall the nozzle wall thickness be less than that

determined by § 55.07-5 of this subchapter.

(2) For nozzle fittings having a bolting flange and an integral flange for riveting, the thickness of the flange attached to the boiler shall also be not less than the thickness of the neck of the fitting.

(c) All circular or elliptical openings of the reinforced type shall comply with the following requirements:

(1) On a line parallel to the longitudinal axis of the shell and passing through the center of the opening, the total cross-sectional area in the complete reinforced opening including the shell and cross-sectional area of the welds and reinforcing rings, if any, within the limits defined by rectangle *ABCD* in figure 52.25-20 (c), shall be at least equal to the area of the cross section *EFGH* plus *JKLM*, obtained by multiplying the shell thickness *T* required by section 52.05-10, using $E=0.90$, by twice the diameter (*d*) of the opening less 2 inches. The limits of rectangle *ABCD* are:

(i) A distance on each side of the center line of the opening equal to the actual inside diameter *d* of the opening in the shell, defined by lines *AD* and *BC*.

(ii) A distance on each side of the middle line of the actual thickness *m* of the shell equal to three times such actual thickness, defined by lines *AB* and *DC*, except that in no case shall the limits extend along the tubular portion of the nozzle connection beyond the surface *NP* of the reinforcement more than two and one-half times the thickness *n* of the nozzle.

(2) On either side of the line parallel to the longitudinal axis of the shell, as determined in paragraph (c) (1) of this section, the strength of the attachment to the vessel of each separate part entering into the construction of the reinforced opening shall be at least equal to the tensile strength of the cross section of the reinforcing part within rectangle *ABCD*, or to the tensile strength of a cross-sectional area equal to the sum of rectangles *QFGR* plus *JSTM*, determined by multiplying the shell thickness *T* required by section 52.05-10, using $E=0.90$, by diameter *d* of the shell opening less 2 inches, whichever tensile strength is smaller. For riveted construction, the strength of the attachment is the shearing strength of the rivets, and for welded construction, it is the strength of the weld in shear or in tension, whichever is smaller.

(3) When there are two or more adjacent openings, the limits for the openings, defined by *AD* and *BC*, shall not be considered to overlap, and in no case shall any portion of a cross section be considered to apply to more than one opening.

(d) Figure 52.25-20 (d) illustrates some types of arc or gas welded connections which are acceptable.

(e) The unit shear stress of a weld shall not exceed 0.8 times the allowable stress in tension.

(f) For arc or gas welded connections, in addition to complying with the regulations given above in paragraph (c), the following additional requirements shall be met:

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(1) Where the thickness t of the thinner of the two parts being joined is $\frac{3}{4}$ inch or less, the dimensions of the welds shall not be less than the requirements given in figure 52.25-20 (d).

(2) Where the thickness t is greater than $\frac{3}{4}$ inch, the dimensions of the welds shall not be less than the requirements given in figure 52.25-20 (d), using a value of $\frac{3}{4}$ inch for t in the formulas.

(g) When the end faces of nozzles or manhole necks are to remain unwelded in the completed vessel, these end faces shall not be cut by shearing unless at least $\frac{1}{8}$ inch of the additional metal is removed by any method that will produce a smooth finish.

(h) The thickness of each independent riveted reinforcing flange or ring shall not be less than given in table 52.25-20 (h).

TABLE 52.25-20 (h)—MINIMUM THICKNESS OF INDEPENDENT RIVETED REINFORCING RINGS OR FLANGES

Thickness of shell plate	Thickness of reinforcing ring or flange	Thickness of shell plate	Thickness of reinforcing ring or flange
Inch	Inch	Inches	Inch
$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{8}$ – $\frac{3}{4}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{5}{8}$
$\frac{1}{2}$ – $1\frac{1}{4}$	$\frac{1}{2}$	1	$1\frac{1}{4}$
$\frac{3}{4}$ – $1\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$ –2	$\frac{3}{4}$
$\frac{1}{2}$ – $1\frac{1}{2}$	$\frac{3}{4}$	Over 2	1
$\frac{1}{2}$ – $\frac{3}{4}$	$\frac{3}{4}$		

(i) The outside diameter of a riveted reinforcing ring or flange shall not be less than one and one-half times the diameter of the opening in the shell.

(j) The rivets attaching the nozzle shall be so placed as to avoid the possibility of the shell plate failing by tearing around the rivet holes.

(k) Manhole or other openings in a flat, stayed surface shall be deemed to

be sufficiently reinforced if the plate is flanged inwards to a depth not less than that determined by § 52.20-15 (b).

SUBPART 52.30—SURFACES REQUIRED TO BE STAYED OR REINFORCED

§ 52.30-1 Definitions. Surfaces to be stayed or reinforced include the following:

(a) Flat plates, heads or areas thereof, such as segments of heads, wrapper sheets, furnace plates, side sheets, combustion chamber tops, etc., which are not self-supporting.

(b) Curved plates constituting the whole or parts of a cylinder subject to external pressure which are not entirely self-supporting.

CROSS REFERENCES: For unstayed flat heads, see subpart 52.20. For flat tube sheets, see subpart 52.45. For curved tube sheets, see subpart 52.40. For flat surfaces of headers, manifolds, etc., see subpart 52.60.

§ 52.30-5 Areas to be stayed. The area of a segment or other portion of a head to be stayed shall be that inclosed by lines as follows:

(a) Where only plain tubes are used in the bounding rows, the line of area shall be at one-half the diameter of the tube in inches, plus 2 inches from the center of the row of tubes.

(b) Where stay tubes are used in the bounding rows, the line of area shall be at one-half the maximum allowable pitch of the stays required for the plate, measured from the center of the row of stay tubes.

(c) On the side of the segments bounded by the shell or furnaces, the lines of area shall be at a distance d from the shell, as shown by figure 52.30-5 (c) the distance d to be computed by the following formula:

$$d = \frac{5T}{\sqrt{P}} \quad (1)$$

where:

d —distance from shell, furnaces or flues

considered self-supporting, in inches.

T —Thickness of plate, in sixteenths of an

inch.

P —maximum allowable pressure, in

pounds per square inch.

(d) The value of h , as shown in figure 52.30-5 (c), shall be equal to one-half the diameter of the tube plus 2 inches where only plain tubes are used in the bounding row, or shall be equal to one-half the maximum allowable pitch of the stays required for the plate where stay tubes are used.

(e) Where the exact area of a circular segment cannot be readily ascertained by other accepted methods, the following formula may be employed, using symbols indicated in figure 52.30-5 (c):

$$A = \frac{4H^2}{3} \sqrt{\frac{2R}{H} - 0.6} \quad (2)$$

where:

A —area of segment which requires support, in square inches.

H —height of segment to self-supporting line, in inches.

R —radius of segment to self-supporting line, in inches.

§ 52.30-10 Computations. (a) The maximum allowable pressure and minimum thickness of plates supported by

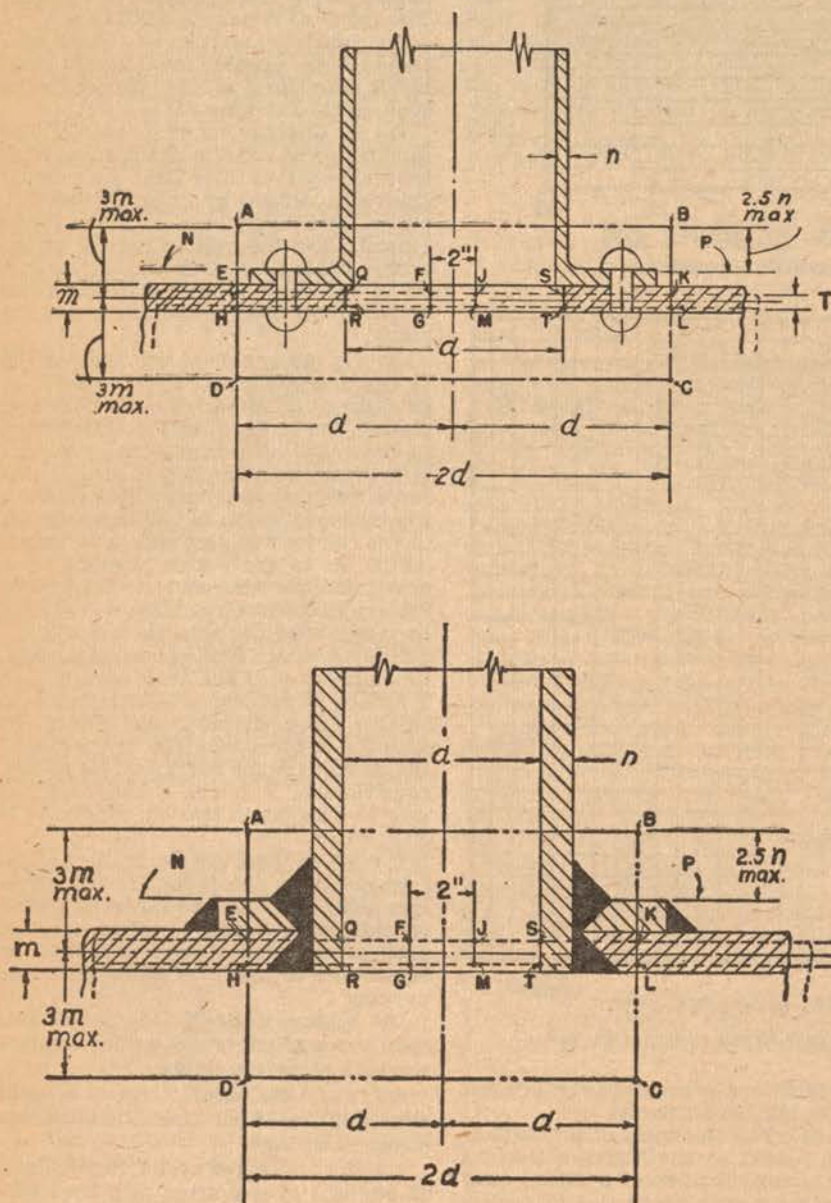
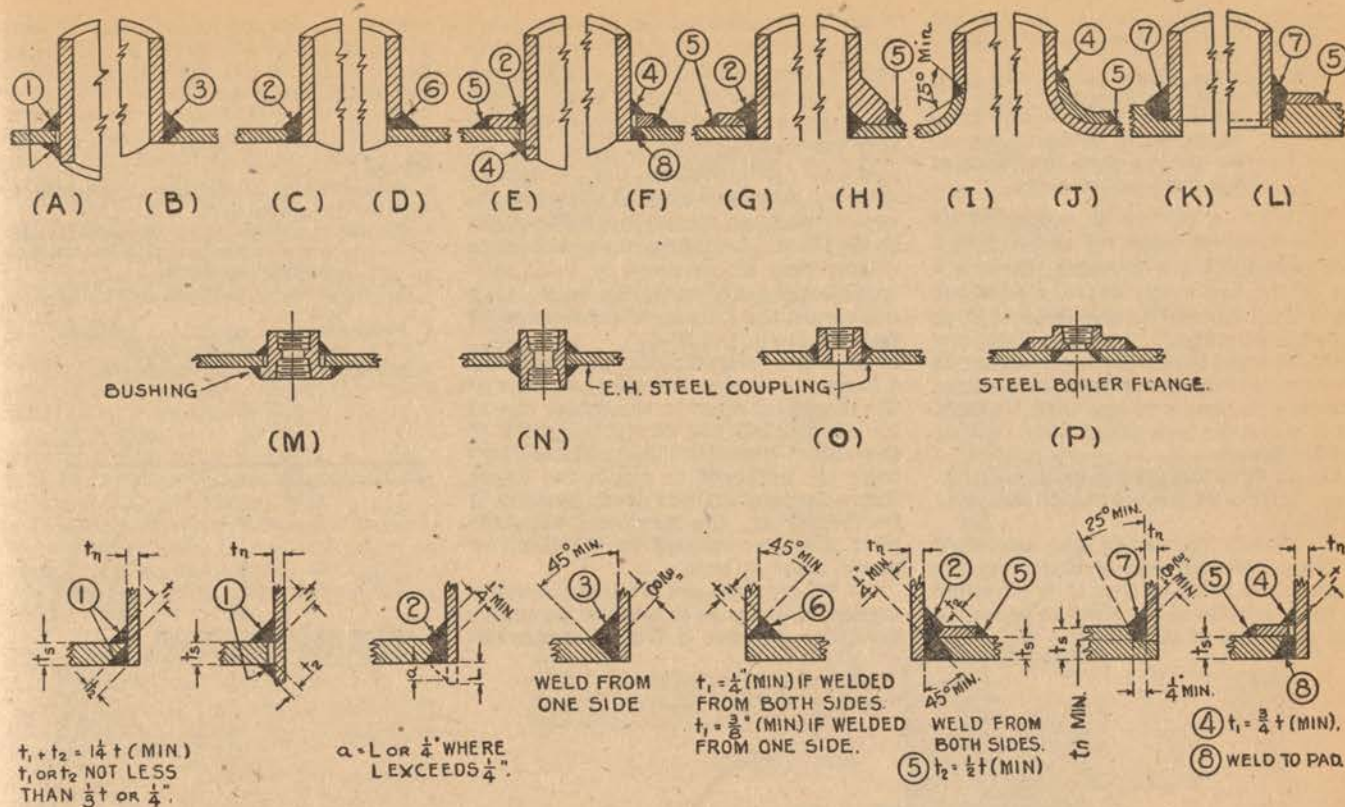


FIGURE 52.25-20 (c)—Computation of reinforced nozzle fittings.



DIMENSIONS ①, ④ & ⑤ ARE MINIMUM VALUES WHERE t = THE THINNER OF t_s OR t_n .
 t_s = REQUIRED SHELL THICKNESS, t_n = REQUIRED NECK THICKNESS.

FIGURE 52.25-20 (d)—Acceptable types of welded nozzles and fittings.

stays shall be determined by the following formulas:

(1) Surfaces without doubling plates:

$$P = \frac{CT^2}{p_1^2 + p_2^2} \quad (1)$$

$$T = \sqrt{\frac{P(p_1^2 + p_2^2)}{C}} \quad (2)$$

(2) Surfaces fitted with doubling plates:

$$P = \sqrt{\frac{C_1 T_1^2}{p_1^2 + p_2^2}} \quad (3)$$

$$T_1 = \sqrt{\frac{P(p_1^2 + p_2^2)}{C_1}} \quad (4)$$

(3) Where doubling plates are used, the minimum allowable thickness shall be not less than 0.67 of the thickness of the plate reinforced and the maximum thickness shall not exceed 0.75 of the thickness of the plate reinforced.

(4) The maximum allowable pitch for stays in either direction shall be computed by the following formulas:

(i) Where stays are equally spaced in both directions:

$$p_1 \text{ or } p_2 = \sqrt{\frac{CT^2}{2P}} \quad (5)$$

(ii) Where the pitch in one direction is greater than that in the other direction:

$$p_1 = 2 \sqrt{\frac{CT^2}{5P}} \quad (6)$$

(iii) With the greater pitch thus determined for one direction, the maximum

pitch in the other direction shall be computed by the formula:

$$p_2 = \sqrt{\frac{CT^2}{P} - p_1^2} \quad (7)$$

(5) In no case shall p_2 be less than one-half p_1 .

where:

P = maximum allowable pressure, in pounds per square inch.

T = thickness of plate, in sixteenths of an inch.

T_1 = combined thickness of plate and doubler or washer, in sixteenths of an inch.

p_1 = pitch of stays in one direction, in inches.

p_2 = pitch of stays in the other direction, in inches.

C and C_1 = coefficients based upon a minimum tensile strength of the plate, not less than 55,000 pounds per square inch, the kind of service to which subjected, and the method of construction, as follows:

Plates exposed to products of combustion:

$C = 238$ for plates under $\frac{1}{16}$ inch in thickness, fitted with screw stays with nuts or welded collars.

$C = 170$ for plates $\frac{1}{16}$ inch and over in thickness, fitted with screw stays with riveted heads.

$C = 250$ for plates $\frac{1}{16}$ inch and over in thickness, fitted with screw stays with nuts or welded collars.

$C = 190$ for all plates fitted with stays secured by rivets.

$C = 275$ for plates fitted with stay tubes screwed and expanded in nests of tubes.

$C = 320$ for plates fitted with stay tubes screwed, expanded, and beaded in nests of tubes.

$C = 185$ for plates fitted with stay tubes screwed and expanded in bounding rows.

$C = 225$ for plates fitted with stay tubes screwed, expanded, and beaded in bounding rows.

Plates not exposed to products of combustion:

$C = 274$ for plates under $\frac{1}{16}$ inch in thickness, fitted with screw stays with nuts or welded collars.

$C = 190$ for plates $\frac{1}{16}$ inch and over in thickness, fitted with screw stays with riveted heads.

$C = 290$ for plates $\frac{1}{16}$ inch and over in thickness, fitted with screw stays with nuts or welded collars.

$C = 212$ for all plates fitted with stays secured by rivets.

$C = 340$ for plates fitted with through stays with nuts on both inside and outside of plate.

$C_1 = 175$ for plates fitted with through stays with nuts inside and outside and having doubling plates covering the entire supported area.

$C_1 = 145$ for plates fitted with through stays, with nuts inside and outside and reinforced by washers efficiently riveted to the outside of the plate, the diameter of the washers to be not less than two-thirds the pitch of the stays.

$C_1 = 155$ for plates fitted with through stays, with inside and outside nuts and reinforced by doubling strips through which the stays are inserted, the width of the

doubling strip to be not less than two-thirds of the pitch of the stays.

$C_1 = 136$ for plates fitted with screw stays and doubling strips between the rows of stays, the width of the doubling strip to be not less than two-thirds of the pitch of the stays.

(6) When a surface is supported by various types of stays for which different coefficients are provided, the average of the two coefficients for adjacent stays shall be used as the value of C or C_1 in the formulas.

(7) Riveted heads are not permissible on stays which are screwed into plates having a thickness of less than $\frac{7}{16}$ inch. Such stays shall be fitted with nuts or welded collars.

(8) No plate less than $\frac{5}{16}$ inch in thickness shall be used in stayed surface construction.

(b) Where two sheets are connected by stays and only one of them requires staying, the value of C or C_1 is governed by the thickness of the sheet to be stayed and the types of stays used.

(c) In determining the maximum distance between the center of a bounding line of tubes and the centers of adjacent stays, the value of C or C_1 given for the thickness of plate and type of stay or stay tube shall be used.

(d) In determining the maximum distance between a flanged edge and the centers of stays, the pitch which applies to the thickness of the plate and the type of stay may be increased up to 25 percent: *Provided*, That the increment shall not exceed the distance d determined by formula (1) in § 52.30-5.

(e) Where stayed plates are riveted to a flange, the distance from the center of the outermost stays to the center line of the rivets shall not exceed the pitch of the stays: *Provided*, That, where staybolts are adjacent to reinforced edges, such as around furnace doors, bottoms of fire boxes, etc., the maximum allowable pitch may be increased by the diameter of the staybolt hole.

(f) Where stays are fitted at the upper corners of fireboxes or combustion chambers, the distance d from the staybolt

nearest the corner to the point of tangency of the corner curve, as shown by figure 52.30-10 (f), shall be determined by the following formula:

$$d = \frac{90T}{D} \sqrt{\frac{C}{2P}} \quad (8)$$

where:

C = applicable coefficient, as provided in paragraph (a).

d = distance from center of staybolt nearest the corner to the point of tangency of the curve.

T = thickness of plate, in sixteenths of an inch.

P = maximum allowable pressure, in pounds per square inch.

D = angle of tangents, in degrees.

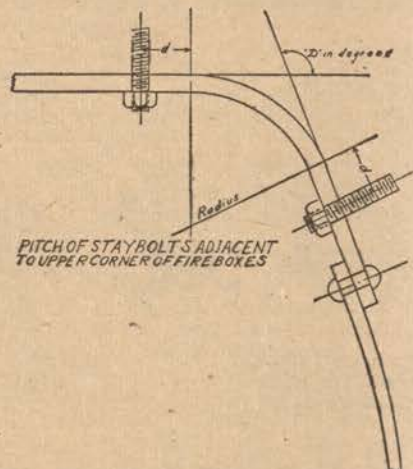


FIGURE 52.30-10 (f)—Pitch of staybolts adjacent to upper corners of fireboxes.

(g) (1) Curved surfaces subject to external pressure and not entirely self-supporting, shall be stayed in accordance with the requirements of subparts 52.30 and 52.35.

(2) Due allowance may be made for the strength inherent in the cylindrical form, except in the case of combustion chamber sheets, by providing that the maximum allowable pressure on a stayed curved surface shall be the sum of the full pressure computed from formula (1) in this section for stayed plates, plus one-half of the pressure determined by formula (3) for curved plates in § 52.50-10 (b); or the full pressure allowable on the curved plate plus one-half of that allowed on the stayed surface, whichever gives the lower value.

SUBPART 52.35—STAYS AND REINFORCEMENTS

§ 52.35-1 *Definitions* — (a) *Through stay*. Through stay is a solid bar extended through both heads of a boiler and threaded at the ends for attachment by means of nuts. With this type of stay the ends are usually upset to compensate for the threading. (See figure 52.35-1 (a).)

(b) *Solid staybolt*. Solid staybolt is a threaded bar screwed through the plates, the ends being riveted over or fitted with nuts or welded collars. (See figures 52.35-1 (b) and 52.35-1 (l).)

(c) *Hollow staybolt*. Hollow staybolt is a hollow threaded bar screwed through the plates, the ends being riveted over or fitted with nuts or welded collars. (See figure 52.35-1 (c).)

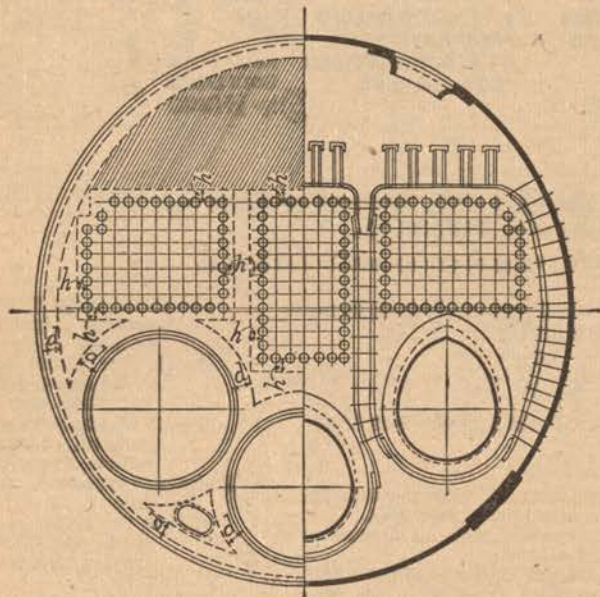
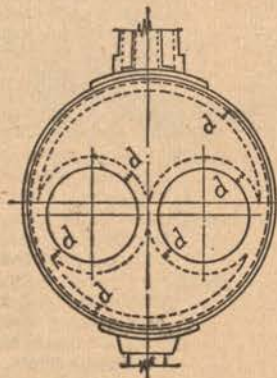


FIGURE 52.30-5 (c)—Determining stayed areas of heads.



(d) **Flexible staybolt.** Flexible staybolt is a bar made with ball-and-socket joint on one end, the cup of the socket being screwed into the outside sheet and covered with a removable cap, the plain end of the staybolt being threaded, screwed through the inside sheet and riveted over. (See figure 52.35-1 (d).)

(e) **Sling stay.** Sling stay is a flexible stay consisting of a solid bar having one or both ends forged for a pin connection to a crowfoot or other structural fitting secured to the stayed plate. (See figure 52.35-1 (e).)

(f) **Crowfoot.** Crowfoot is a forged fitting with palms or lugs secured to the head to form a proper connection with a sling stay. (See figure 52.35-1 (f).)

(g) **Crowfoot stay.** Crowfoot stay is a solid bar stay terminating in a forged fork with palms or lugs for attachment to the plate. (See figure 52.35-1 (g).)

(h) **Diagonal stay.** Diagonal stay is a bar or formed plate forged with palms or lugs for staying the head of the boiler to the shell diagonally. (See figure 52.35-1 (h).)

(i) **Gusset stay.** Gusset stay is a triangular plate used for the same purpose as a diagonal stay and attached to the head and the shell by angles, flanges, or other suitable means of attachment. (See figure 52.35-1 (i).)

(j) **Dog stay.** Dog stay is a staybolt, one end of which extends through a girder, dog, or bridge, and is secured by a nut, the other end being screwed through the plate which it is supporting and riveted over or fitted with a nut or welded collar. (See figure 52.35-1 (j).)

(k) **Girder.** Girder is a bridge, built up of plates or structural shapes separated by distance pieces, a forging, or a formed plate, which spans an area requiring support, abutting thereon and supporting the girder stays or staybolts. (See figure 52.35-1 (k).)

(l) **Welded collar.** Welded collar is a beveled ring formed around the end of a screw stay by means of arc or gas welding. It is used in lieu of a nut. (See figure 52.35-1 (l).)

(m) **Reinforcement.** Reinforcement is a doubling plate, washer, structural shape, or other form for stiffening or strengthening a plate.

(n) **Stay tube.** Stay tube is a thick-walled tube used in fire-tube boilers to stay the tube sheets.

(o) **Telltale hole.** Telltale hole is a small hole having a diameter not less than $\frac{3}{16}$ inch drilled in the center of a solid stay and extending to at least $\frac{1}{2}$ inch beyond the inside surface of the sheet.

§ 52.35-5 **Materials.** (a) Round bar stays which require no welding or forging other than upsetting at the ends for threading or to form eyes for use in conjunction with crowfeet, or similar fastenings, shall conform to the requirements of subpart 51.07, 51.10, or 51.13.

(b) Crowfeet, lugs, and similar connections for stays shall be forgings without welds conforming to the requirements of subpart 51.46.

(c) Forged-welded stays or parts thereof shall conform to the requirements of subpart 51.13. All welds

in the body of the stay shall be made by the hammer-weld process.

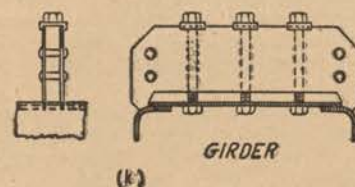
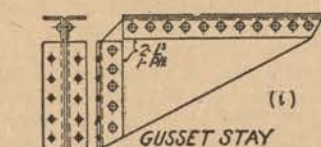
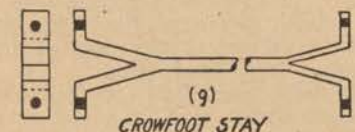
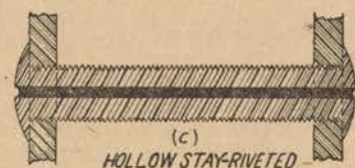
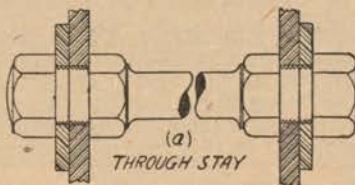
(d) Stiffeners made of structural shapes shall conform to the requirements specified in subpart 51.10.

(e) Gusset and diagonal stays made of steel plate, also doubling plates and girders shall conform to the requirements specified in subpart 51.04.

(f) Stay tubes shall conform to the requirements of subpart 51.25, 51.28, or 51.31.

(g) Rivets shall conform to the following requirements:

Steel rivets..... Subpart 51.18
Iron rivets..... Subpart 51.19



(h) Nuts for screw stays shall be made of steel, conforming to the requirements of subpart 51.46 or 51.55, or, refined wrought iron, conforming to the requirements of subpart 51.13.

§ 52.35-10 **Workmanship.** (a) The ends of stay bars and stay tubes which are upset for threading shall be subsequently annealed.

(b) Holes for screw stays shall be drilled and tapped fair and true and shall have a full thread.

(c) All holes for rivets shall be drilled and shall be slightly counter-sunk in order to form a fillet at point and head.

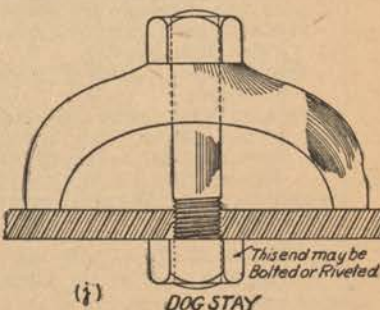
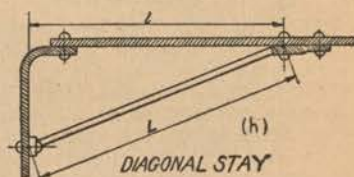
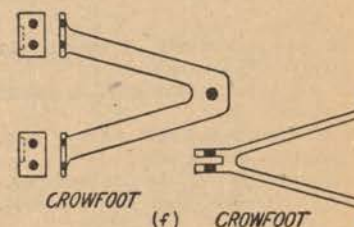
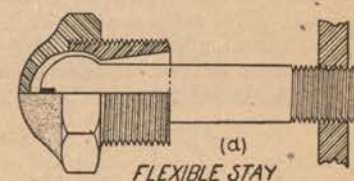
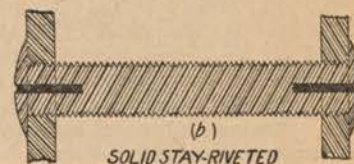


FIGURE 52.35-1—Acceptable types of boiler stays.

Rivets shall be of sufficient length to fill the rivet holes completely and to form a head of proportionate strength to the body of the rivet.

(d) Holes for tubes or through stays may be made by punching a pilot hole in the center, but shall be machined to size by a rotating cutter, or otherwise be drilled from the solid plate.

(e) When jointed longitudinal stays are fitted between the back and front tube plates and connected by pins, such pins may be fitted slack in the holes, but the total clearance on both ends shall not exceed $\frac{1}{16}$ inch.

(f) Where stay tubes are used for supporting flat surfaces they shall be fitted with threads at both ends, screwed into the tube sheets and rolled tight with expanders, in addition to which they may be beaded. Making such tubes tight by calking is not permissible.

§ 52.35-15 *Computations.* (a) The maximum allowable pressure and the required area of direct stays shall be computed by the following formulas (in making computations, the least sectional area of the stay shall be taken):

$$P = \frac{aC}{A} \quad (1)$$

$$a = \frac{PA}{C} \quad (2)$$

where:

P = maximum allowable pressure, in pounds per square inch.

A = area supported by the stay, in square inches.

a = required cross-sectional area of stay, in square inches.

C = coefficients based on the minimum tensile strength of the material used, as follows:

C = 10,000 for solid steel through stays.

C = 9,000 for solid steel screw stays having diameters of 1 inch and above.

C = 9,000 for jointed steel stays.

C = 8,000 for solid or hollow steel screw staybolts having diameters of 1 inch or less.

C = 8,000 for refined wrought-iron stays or staybolts having diameters of 1 inch and above.

C = 8,000 for steel stays formed from plates without welds.

C = 7,500 for wrought-iron or steel stay tubes.

C = 7,500 for flexible screw staybolts.

C = 7,500 for refined wrought-iron screw staybolts having diameters less than 1 inch.

C = 6,000 for welded refined wrought-iron stays.

(b) In computing the gross area supported by a stay, the pitch of the stays shall be used, but the least sectional area of the stay may be deducted therefrom to obtain the net area.

(c) Where stays are adjacent to the outer edge of the surface to be stayed and special allowances are made for the spacing, the area A shall be determined by deducting such parts of the surface as may be considered self supporting in accordance with § 52.30-5.

(d) The required cross-sectional area of a diagonal stay shall be determined by the following formula:

$$a_1 = \frac{aL}{l} \quad (3)$$

where:

a_1 = required area of diagonal stay, in square inches.

a = required area of direct stay computed by formula (2) in this section, in square inches.

L = length of diagonal stay as shown by figure 52.35-1 (h), in inches.

l = length of line drawn at right angles to the surface to be supported, and extending to the center of the first rivet in the diagonal stay as shown by figure 52.35-1 (h), in inches.

(e) The minimum sectional area of a gusset stay constructed of triangular plates secured to single or double rolled shapes along the two sides, shall be 10 percent greater than that determined by formula (3) in this section for diagonal stays.

(f) In determining the net cross-sectional area of drilled or hollow staybolts, the cross-sectional area of the hole shall be deducted if the diameter exceeds $\frac{3}{16}$ inch.

(g) Where a cylindrical shell is pierced by more than three holes for stays or other purposes on a line parallel with the axis of the shell, the relative strength of the ligaments between such holes shall not be less than that of the ligaments in the outer row of rivets in the longitudinal joint. If the construction necessitates a lower relative strength, this must be used for the value of E in the formula (1), (2), or (3) in § 52.05-10, for determining the maximum allowable pressure or minimum thickness of plate.

(h) The minimum sectional area of a pin subject to double shear shall be at least 80 percent of the required cross-sectional area of the stay.

(i) Each branch of a crowfoot or similar component part of a divided stay shall be proportioned to support at least two-thirds of the entire load.

(j) Eyes for pin connections shall be properly formed to the body of the stays. The minimum outside diameter of the eye shall be one and one-fourth times that of the pin. The minimum thickness of a single eye shall be the diameter of the pin; that of the double eye shall be two-thirds of the diameter of the pin; the cross-sectional area of any part of an eye shall be such that the two sides of a single eye shall equal at least one and one-fourth, and the four sides of a forked eye shall equal at least one and one-half times the strength of the body of a stay.

(k) The strength of the rivets connecting crowfoot braces, or any other type of reinforcement, shall equal one and one-half times the strength of the connecting stay.

(l) Palms, lugs, or flanges which are to be riveted, shall have a minimum width at the rivet hole exceeding the diameter of the rivet head, and shall have a cross-sectional area exclusive of the rivet hole not less than one and one-fourth times the required cross-sectional area of the body of the stay. Where

there are two or more rivets located in the longitudinal axis of the stay, the strength of the palm or lug at the second or subsequent rivet hole may be reduced to not less than one and one-fourth times the combined strength of the rivet at that point and those beyond.

§ 52.35-20 *Detail requirements.* (a) All screw staybolts, except flexible staybolts, shall have a telltale hole in the center of each end not less than $\frac{3}{16}$ inch diameter extending not less than $\frac{1}{2}$ inch beyond the inside of the plate.

(b) Joining of steel stays in the body by any process of welding is not permissible.

(c) The length of staybolts shall not exceed 20 diameters.

(d) Where the length of a boiler exceeds 18 feet, the through stays shall be supported in the middle.

(e) Where the heads of staybolts are riveted over, the end of the staybolt before riveting shall extend not less than $\frac{1}{4}$ inch from the surface of the plate to provide sufficient material for a substantial head.

(f) Where welded collars are used instead of nuts, the depth of the collar, measured on the staybolt, and the width, measured on the plate, shall not be less than one-half the diameter of the staybolt.

(g) The minimum thickness of nuts used in connection with screw stays shall be one-half of the diameter of the stay, but in no case less than $\frac{3}{4}$ inch. The stays shall be so placed in relation to the joints that the plates can be calked without removing the nuts.

SUBPART 52.40—TUBE SHEETS OF WATER-TUBE BOILERS

§ 52.40-1 *Definitions.* (a) *Curved tube sheet.* Curved tube sheet is a section of the shell of a boiler drum formed to an arc of a circle and perforated for nests of tubes.

(b) *Flat tube sheet.* Flat tube sheet is the tube plate of box headers of certain types of water-tube boilers.

(c) *Longitudinal ligament.* Longitudinal ligament is the minimum section of metal between two tube holes on a line parallel with the axis of the drum.

(d) *Circumferential ligament.* Circumferential ligament is the minimum section of metal between two tube holes on a line around the circumference of the drum.

(e) *Diagonal ligament.* Diagonal ligament is the minimum section of metal between two tube holes in adjacent rows, measured diagonally from one row to the other.

§ 52.40-5 *Computations for curved tube sheet.* (a) The maximum allowable pressure and minimum thickness of a curved tube sheet shall be determined by formula (1), (2), or (3) in § 52.05-10, using the lowest value of E, derived as follows:

(b) When a shell is pierced for a single row of tubes or for two or more rows well apart, as in a double butt-strap joint, or where reinforcing plates are fitted, the efficiency of the ligament between tube holes shall be determined by formula (1) in § 52.05-25 (b).

(c) When a shell is pierced for tubes in a series of rows parallel to its axis, the efficiency of the ligament between the tube holes in any row shall be determined according to the provisions of this section.

(d) When the pitch of the tube holes in any row is uniform. (See figure 52.40-5 (d).)

$$E = \frac{p_1 - d}{p_1} \quad (1)$$

(e) When the pitch of the tube holes in any row is not uniform (see figures 52.40-5 (e1) and 52.40-5 (e2)) the calculations shall be made for a section of the row not exceeding the diameter of the shell and

$$E = \frac{p_1 - nd}{p_1} \quad (2)$$

(f) (1) When the holes in one row are placed so as to form diagonal ligaments with the holes in an adjacent row (see figure 52.40-5 (f1)) the efficiency of these ligaments shall be taken from the diagram figure 52.40-5 (f2). To use this diagram compute the value of $\frac{p_d}{p_1}$ and also the efficiency of the longitudinal ligament. Next find in the diagram the vertical line corresponding to the longitudinal efficiency of the ligament and follow this line vertically to the point where the diagonal line representing the ratio of $\frac{p_d}{p_1}$ intersects. By projecting this line horizontally to the left on the edge of the diagram the diagonal efficiency of the ligament may be read from the scale. If this efficiency is less than that of the longitudinal ligament it shall be used in computing the allowable pressure. The symbols used in the above formulas are as follows:

p = longitudinal pitch of tube holes, in inches.
 p_d = diagonal pitch of tube holes, in inches.
 p_1 = length of section of the row considered, in inches.
 d = diameter of tube holes, in inches.
 n = number of tube holes in section p_1 .

(2) The pitch of the tube holes shall be measured either on the flat plate before rolling or on the middle line of the plate after rolling.

(g) The strength of the circumferential ligaments between tube holes shall be at least one-half the required strength of the longitudinal ligaments.

(h) When the tube holes are not normal to the plate, the plate thickness shall be sufficient to provide a parallel seating not less than $\frac{3}{8}$ inch in depth between planes at right angles with the axis of the tube for tubes $2\frac{1}{2}$ inches in diameter and under; for tubes having diameters over $2\frac{1}{2}$ inches, the depth of the parallel seating shall be not less than $\frac{1}{2}$ inch.

§ 52.40-10 Reinforcement of ligaments. (a) Where reinforcing plates are applied to the drums of water-tube boilers to strengthen the shell at the point where the tubes enter, they shall be riveted to the shell, and where outside caulking is used, the rivet spacing shall be designed to stay the plates in accordance with the requirements of subparts 52.30 and 52.35.

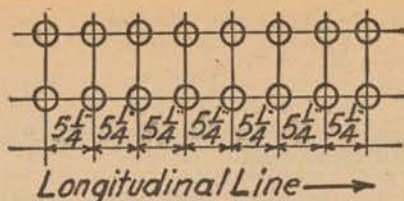


FIGURE 52.40-5 (d)—Example of tube spacing with pitch of holes equal in every row.

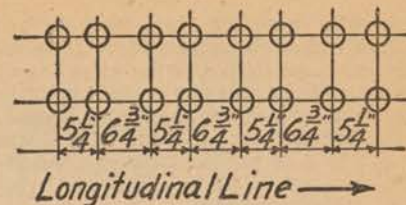


FIGURE 52.40-5 (e1)—Example of tube spacing with pitch of holes unequal in every second row.

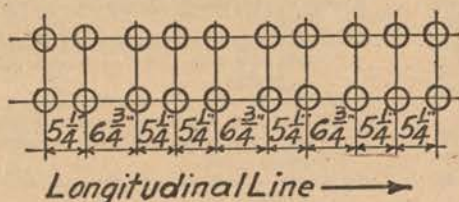


FIGURE 52.40-5 (e2)—Example of tube spacing with pitch of holes varying in every second and third row.

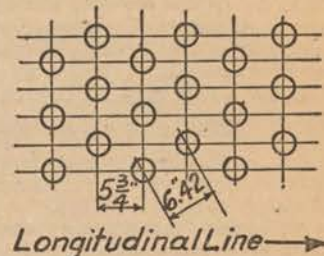


FIGURE 52.40-5 (f1)—Example of tube spacing with holes on diagonal lines.

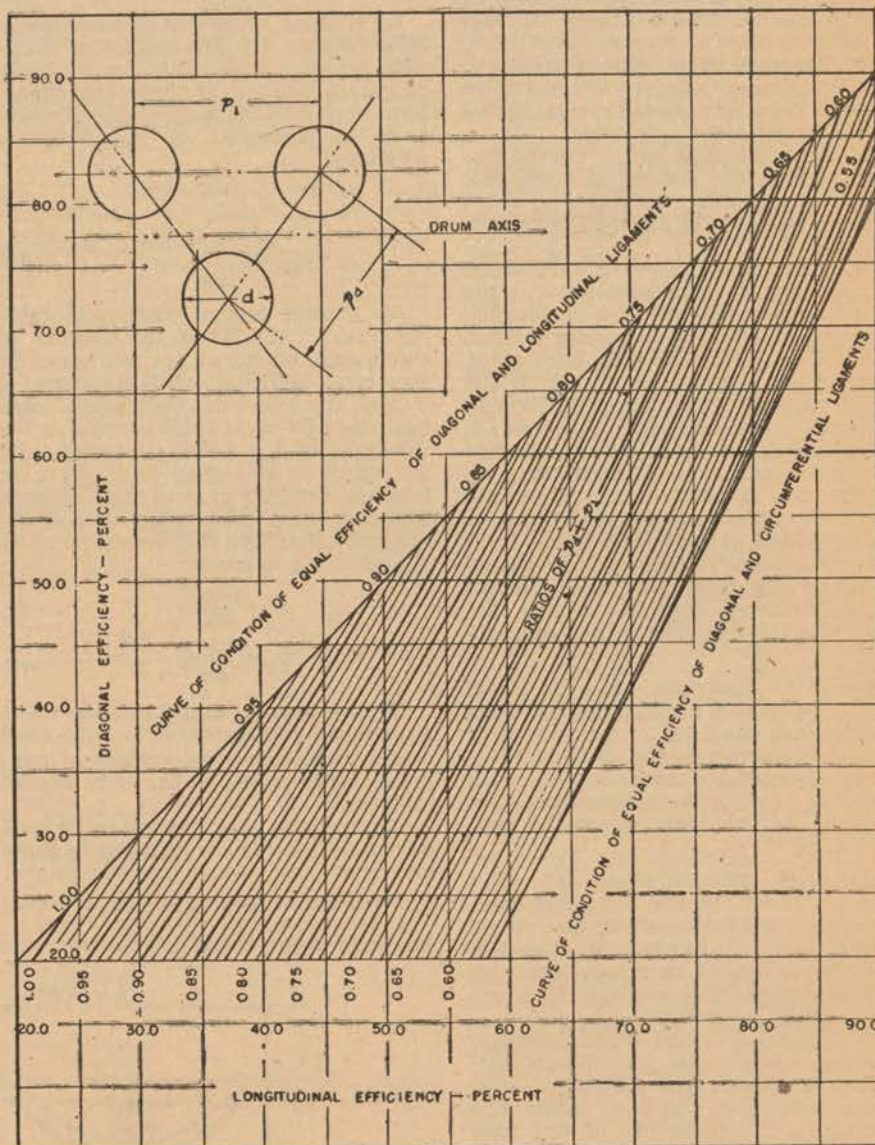


FIGURE 52.40-5 (f2)—Diagrammatic computation of diagonal efficiency.

(b) The combined drum shell and reinforcing plate or plates and riveted connections shall have a factor of safety of not less than 4.5 in the ligaments when calculated in accordance with § 52.40-5. When reinforcing plates or butt straps are exposed to the products of combustion, the joints shall be protected therefrom, when necessary.

SUBPART 52.45—COMBUSTION CHAMBERS AND TUBE SHEETS OF FIRE-TUBE BOILERS

§ 52.45-1 *Definition*—(a) *Combustion chamber*. Combustion chamber, within the meaning of this section, is that part of an internally-fired boiler in which combustible gases may be burned after leaving the furnace.

(b) *Separate combustion chamber*. Separate combustion chamber is a combustible chamber which is connected to one furnace only.

(c) *Common combustion chamber*. Common combustion chamber is a combustion chamber connected to two or more furnaces in a boiler.

(d) *Crown or top plate*. Crown or top plate is the top of a combustion chamber and is usually supported by girder stays or by sling stays or braces.

(e) *Wrapper sheet*. Wrapper sheet is the side plate of any type of combustion chamber and also the bottom plate of a common combustion chamber.

(f) *Curved bottom plate*. Curved bottom plate is the bottom of a separate combustion chamber formed to an arc of a circle and usually designed to be self-supporting.

(g) *Combustion chamber tube sheet*. Combustion chamber tube sheet is the plate forming the end of a combustion chamber in which the tubes are secured.

(h) *Combustion chamber back sheet*. Combustion chamber back sheet is the plate opposite the tube sheet forming the back of the combustion chamber. It is usually stayed to the back head of the boiler by means of screw stays, or, in the case of double-ended boilers, to the back of the combustion chamber of the other end of the boiler.

(i) *Structural stiffeners*. Structural stiffeners are rolled shapes or flanged plates which are used to stiffen a surface which is not entirely self-supporting.

§ 52.45-5 *Materials*. (a) All plates forming parts of combustion chambers or fireboxes shall conform to the general specifications for the shell plates.

(b) Structural shapes of any form used for stays and reinforcements shall conform to the requirements of subpart 51.10.

§ 52.45-10 *Computations*—(a) *Formulas*. The maximum allowable pressure and minimum thickness of all stayed parts of combustion chambers shall be computed in accordance with formulas provided in subparts 52.30 and 52.35, except as follows:

(b) *Tube sheets*. (1) When the crown plate of a combustion chamber is supported by girders, transmitting the load to the tube plate and back sheet, thus subjecting the ligaments of the tube sheet to a compressive stress, the maximum allowable pressure shall be determined by formulas in subparts 52.30 and

52.35, but shall not exceed that given by the following formula:

$$P = \frac{2CT(p-d)}{Lp} \quad (1)$$

nor shall the thickness be less than that given by formula:

$$T = \frac{LpP}{2C(p-d)} \quad (2)$$

where:

P = maximum allowable pressure, in pounds per square inch.

p = least horizontal pitch of tubes, in inches.

L = total length of combustion chamber over the tube sheet and back sheet, in inches.

T = thickness of tube plate, in inches.

C = 13,300 (the allowable crushing stress per square inch of cross-sectional area).

d = inside diameter of plain tubes, in inches.

(2) Where tubes are staggered, the vertical distance between the center lines of tubes in adjacent rows shall not be less than

$$\frac{1}{2}\sqrt{2dp+d^2} \quad (3)$$

(c) *Curved bottom plate without reinforcement*. (1) The maximum allowable pressure and minimum thickness of curved bottoms of separate combustion chambers without reinforcement shall be computed by the following formulas:

$$P = \frac{26}{R}(300T - 1.03L) \quad (4)$$

$$T = \frac{\frac{PR}{26} + 1.03L}{300} \quad (5)$$

(d) *Curved bottom plate with reinforcement*. (1) When the bottoms of combustion chambers are reinforced by structural stiffeners, such as angle or T bars, the minimum thickness of such bars shall be equal to 80 percent of the thickness of the plate reinforced, and the depth of web shall be equal to at least one-half the pitch of the stiffeners. The maximum allowable pressure and minimum thickness shall be computed by the following formulas:

$$P = \frac{(480T)^2}{2RL} \quad (6)$$

$$T = \frac{\sqrt{2RLP}}{480} \quad (7)$$

(2) The spacing and size of the rivets attaching the stiffeners to the plates shall comply with the requirements of subparts 52.30 and 52.35, for stayed surfaces.

(e) *Symbols*. The symbols to be used in connection with the formulas in paragraphs (c) and (d) of this section are:

P = maximum allowable pressure, in pounds per square inch.

T = thickness of plate, in inches.

R = external radius to which plate is formed, in inches.

L = length of plate between supports measured on a line parallel to the axis of the boiler, in inches.

(f) *Girders or crown bars*. The maximum allowable pressure and the minimum thickness of crown bars or girders supporting the tops of combustion chambers shall be computed by the following formulas:

$$P = \frac{Cd^2T}{(L-p_2)p_1L} \quad (8)$$

$$T = \frac{PLp_1(L-p_2)}{Cd^2} \quad (9)$$

where:

P = maximum allowable pressure, in pounds per square inch.

L = length of girder between supports (from inside of tube sheets to inside of combustion chamber back plate), in inches.

p_1 = pitch between girders from center to center, in inches.

p_2 = pitch of supporting bolts, in inches. (Not to exceed maximum allowable pitch for plate thickness; see subpart 52.30.)

d = depth of girder, in inches.

T = thickness of girder, in inches (aggregate thickness where girder consists of 2 plates).

C = 6,800 where girder is fitted with one supporting bolt.

C = 10,300 where girder is fitted with two or three supporting bolts.

C = 11,400 where girder is fitted with four or five supporting bolts.

C = 12,200 where girder is fitted with six or more supporting bolts.

§ 52.45-15 *Detail requirements*. (a) Where structural steel shapes or forged fittings are used to form connections between stays and plates that are not self-supporting, the eyes for rivet or pin connections in such fastenings shall comply with the requirements of § 52.35-15.

(b) Curved bottoms of common combustion chambers shall be considered a flat surface and stayed in accordance with the requirements of subparts 52.30 and 52.35.

(c) When plates are flanged to form the combustion chamber and back connections including the landing for furnace or flue attachments, the minimum inner radius shall be not less than one and one-half times the thickness of the plate flanged.

SUBPART 52.50—FURNACES AND FLUES

§ 52.50-1 *Definitions*—(a) *Furnace*. Furnace, within the meaning of this subpart, is a firebox or a large flue in which the fuel is burned.

(b) *Corrugated furnace*. Corrugated furnace is a cylindrical shell wherein corrugations are formed circumferentially for additional strength and to provide for expansion. (See figures

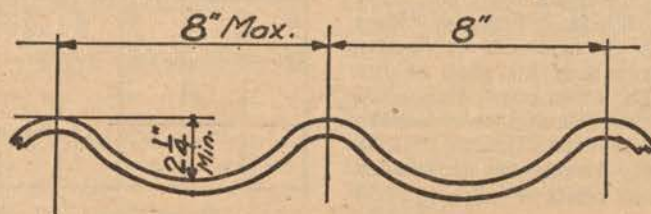


FIGURE 52.50-1 (b1)—Leeds suspension bulb furnace.

52.50-1 (b1), 52.50-1 (b2), 52.50-1 (b3), 52.50-1 (b4), and 52.50-1 (b5).)

(c) *Purves ribbed furnace.* Purves ribbed furnace is a cylindrical shell in which ribs or projections are formed circumferentially to provide additional strength. (See figure 52.50-1 (c).)

(d) *Adamson ring furnace.* Adamson ring furnace is a cylindrical shell made in short sections, the ends of the sections being flanged and riveted together through a reinforcing ring. (See figure 52.50-1 (d).)

(e) *Plain furnace.* Plain furnace is a cylindrical shell usually made in sec-

tions united by means of riveted joints. (See figure 52.50-1 (e).)

(f) *Flues.* Flues are cylindrical shells made of seamless or welded tubing, or with a riveted longitudinal joint, the ends being attached by rivets. Their purpose is to provide additional heating surface and to form a path for the products of combustion. (See figure 52.50-1 (e).)

§ 52.50-5 *Materials.* (a) All furnaces shall be constructed of steel plates conforming to the requirements for firebox quality steel as given in subpart 51.04.

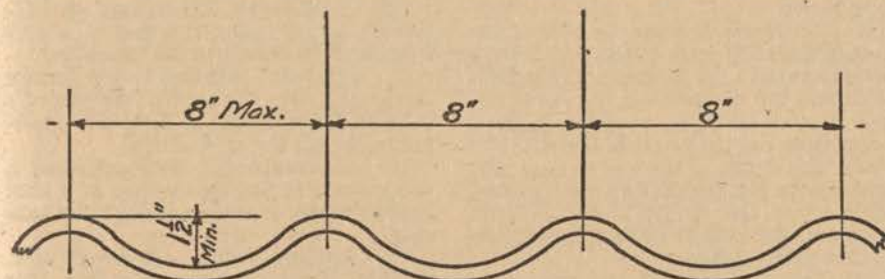


FIGURE 52.50-1 (b2)—Morison furnace.

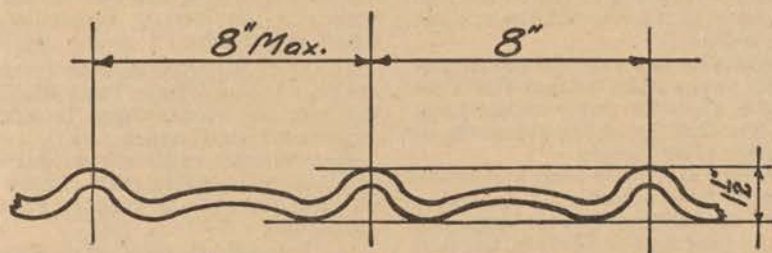


FIGURE 52.50-1 (b3)—Deighton furnace.

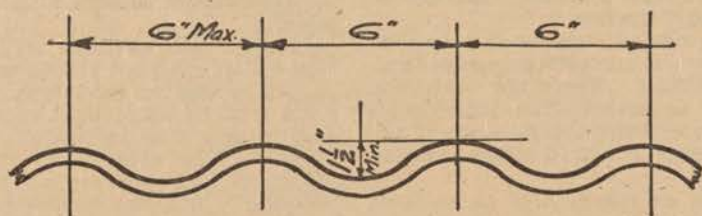


FIGURE 52.50-1 (b4)—Fox furnace.

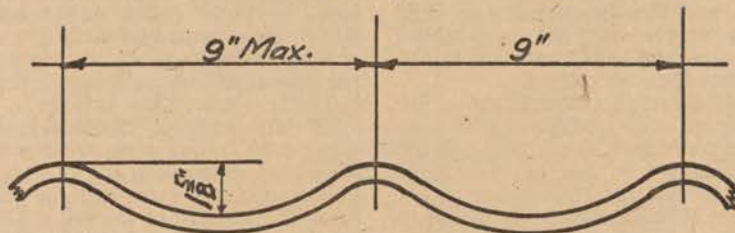


FIGURE 52.50-1 (b5)—Brown furnace.

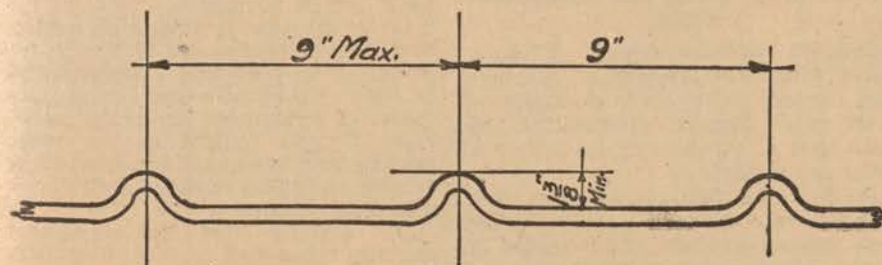


FIGURE 52.50-1 (c)—Purves ribbed furnace.

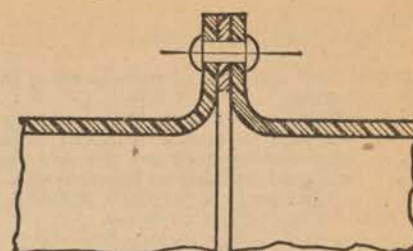


FIGURE 52.50-1 (d)—Adamson ring furnace.



FIGURE 52.50-1 (e)—Circular riveted flue.

(b) Riveted flues shall be made of firebox quality steel plates conforming to the requirements of subpart 51.04.

(c) Welded flues may be constructed of firebox quality steel plates conforming to the requirements of subpart 51.04 or of steel or wrought iron pipe conforming to the requirements of subpart 51.34, 51.37, or 51.43.

(d) Seamless flues may be constructed of steel tubing conforming to the requirements of subpart 51.34 or 51.37.

§ 52.50-10 *Computations.*—(a) *Corrugated or ribbed furnaces.* (1) The maximum allowable pressure and minimum thickness of corrugated or ribbed furnaces shall be computed by the following formulas:

$$P = \frac{CT}{D} \quad (1)$$

$$T = \frac{DP}{C} \quad (2)$$

where:

P = maximum allowable pressure, in pounds per square inch.

T = minimum thickness of plate, in inches.

D = external diameter of furnace at bottom of corrugations, in inches.

C = coefficients, as follows:

$C = 15,700$ for Leeds suspension bulb furnace.

$C = 14,700$ for Morison or Deighton furnace.

$C = 12,500$ for Fox, Purves, or Brown furnace.

(2) The spacing and depth of the corrugations shall be in accordance with figures 52.50-1 (b1), 52.50-1 (b2), 52.50-1 (b3), 52.50-1 (b4), 52.50-1 (b5), and 52.50-1 (c), as shown in section 52.50-1. New furnaces shall be rolled to practically a true circle. The maximum distortion permissible from the true circle shall not exceed $\frac{1}{4}$ inch, and all new furnaces shall be measured by an inspector to ascertain that this tolerance has not been exceeded.

(b) *Adamson ring or plain furnaces.* The maximum allowable pressure and minimum thickness of furnaces of the Adamson ring or plain cylindrical types shall be computed by the following formulas:

$$P = \frac{52}{D} (300T - 1.03L) \quad (3)$$

$$T = \frac{\frac{PD}{52} + 1.03L}{300} \quad (4)$$

where:

P = maximum allowable pressure, in pounds per square inch.

D = external diameter of furnace shell, in inches.

L = length of a section for Adamson ring furnaces or riveted flues, or total length between centers of head rivet seams where the flues are made without circumferential joints, in inches.

T = thickness of plate, in inches.

(c) **Flues.** (1) The maximum allowable pressure and minimum thickness of plain riveted flues shall be computed by formulas (3) and (4) provided in paragraph (b) of this section. For seamless or welded flues not less than 6 nor more than 18 inches in outside diameter and subject to external pressure, the following formulas shall be used:

$$P = \frac{86670T - 1386D}{5D} \quad (5)$$

$$T = \frac{D(5P + 1386)}{86670} \quad (6)$$

where:

P = maximum allowable pressure, in pounds per square inch.

T = thickness of flue, in inches.

D = external diameter of flue, in inches.

(2) As a matter of convenience, table 52.50-10 is computed from the preceding formulas for seamless or welded flues.

TABLE 52.50-10—MAXIMUM ALLOWABLE PRESSURE AND MINIMUM THICKNESS OF SEAMLESS OR WELDED FLUES SUBJECT TO EXTERNAL PRESSURE

Outside diameter of flue, inches	Maximum allowable pressure in pounds per square inch						
	100	120	140	160	180	200	220
	Thickness of flue (inches)						
6.....	0.130	0.137	0.144	0.151	0.158	0.165	0.172
7.....	.152	.161	.169	.177	.185	.193	.201
8.....	.174	.184	.193	.202	.211	.221	.229
9.....	.196	.206	.217	.228	.238	.248	.258
10.....	.218	.229	.241	.253	.264	.276	.287
11.....	.239	.252	.265	.278	.290	.303	.316
12.....	.261	.275	.289	.303	.317	.331	.344
13.....	.283	.298	.313	.328	.343	.359	.373
14.....	.305	.321	.337	.354	.369	.386	.402
15.....	.326	.344	.361	.379	.396	.414	.430
16.....	.348	.367	.385	.405	.422	.441	.459
17.....	.370	.390	.409	.430	.448	.469	.488
18.....	.392	.413	.433	.455	.476	.497	.516

§ 52.50-15 **Detail requirements.** (a) The minimum thickness of furnaces shall be $\frac{5}{16}$ inch, and the maximum thickness shall be $\frac{13}{16}$ inch.

(b) Where furnaces are constructed with riveted joints, the minimum efficiency of such joints shall not be less than 50 percent of the solid plate. Such joints may be of the lap-riveted type provided the furnace does not exceed 36 inches in length or height. All longitudinal riveted joints shall be located at the bottom of the furnace or flue.

(c) The thickness of corrugated and ribbed furnaces shall be ascertained by actual measurements taken by an inspector. Such furnaces shall be drilled by the manufacturer for a $\frac{3}{8}$ -inch pipe tap and fitted with a screw plug which can be removed by the inspector when taking measurements, the plug to be located as follows:

(1) *For Leeds, Morison, Deighton, Fox, and Brown types of furnaces.* At the crest of the waterside corrugation, not less than four corrugations from either end.

(2) *For Purves ribbed furnaces.* At the center of the second flat from either end.

(3) *Test plug.* Furnaces shall be installed so that the test plug is located at the bottom.

(d) (1) Adamson ring furnaces shall be made in sections not less than 18 inches and not more than 24 inches in length. They shall be flanged with a radius measured on the fire side of not less than three times the thickness of the plate and the flat portion of the flange outside of the radius shall be at least three times the diameter of the rivet holes.

(2) The distance from the edge of the rivet holes to the edge of the flange shall be not less than the diameter of the rivet holes and the diameter of the rivets before driving shall be at least $\frac{1}{4}$ inch larger than the thickness of the plate.

(3) The depth of the reinforcing ring between the flanges shall be not less than three times the diameter of the rivet holes and the ring shall be substantially riveted to the flanges.

(4) The fire edge of the ring shall terminate at or outside the point of tangency to the curve of the flange and the thickness of the ring shall be not less than $\frac{1}{2}$ inch.

(e) When furnaces are flanged for attachment to the front head or rear tube sheet, the minimum inner radius shall be not less than twice the thickness of the furnace plate flanged.

(f) Where externally fired boilers are fitted with flues exceeding 5 inches in diameter the minimum water space between the flues and/or between the wall of a flue and the shell of the boiler, shall not be less than 3 inches, measured at the middle of the flue.

(g) Corrugated furnaces may be constructed by any approved process of forge or arc welding. Where arc welding is employed in making the longitudinal joints, the following modifications in the requirements for class I welding will be acceptable:

(1) The customary test plates need not be furnished, provided each furnace has sufficient material left on one end to obtain a satisfactory guided side bend specimen, which shall not be detached until all work and heat treatment on the furnace has been completed.

(2) Radiographic examination of the furnace seam, either before or after corrugations are formed, is not required, but will be accepted in lieu of the guided side bend specimen. If radiographs are taken, they shall be examined by and be acceptable to an inspector.

SUBPART 52.55—BOILER AND SUPERHEATER TUBES

§ 52.55-1 **Definitions.**—(a) *Tubes.* Tubes, within the meaning of this subpart, are cylindrical shells of comparatively small diameter constituting the main part of the heating surface of a boiler or superheater.

(b) *Safe end.* Safe end is a short piece of boiler tube which is usually thicker than the ordinary tube and is welded to a tube of lighter gauge for the purpose of lengthening it.

(c) *Seamless tube.* Seamless tube is a tube without any longitudinal joint.

(d) *Electric-resistance-welded tube.* Electric-resistance-welded tube is a tube the longitudinal joint of which is made by the electric-resistance butt welding process and the tube is required to be normalized after welding.

(e) *Lap-welded tube.* Lap-welded tube is a tube made with a longitudinal rolled or hammered lap-welded joint.

(f) *Stay tube.* Stay tube is a thick-walled tube, the end of which is usually thickened by upsetting to compensate for threading. Such tubes are used for staying tube sheets into which they are screwed and expanded.

(g) *Expanding.* Expanding is the process of enlarging the end of a tube to make it fit tightly in the tube sheet.

(h) *Beading.* Beading is the process of turning over the protruding end of a tube after expanding to form a supporting collar for the tube sheet.

(i) *Bell-mouthing.* Bell-mouthing is the process of flaring the end of a tube beyond where it is expanded in the tube sheet.

(j) *Spirally-fluted seamless tube.* Spirally-fluted seamless tube is a tube made with a circular wall corrugated longitudinally and bent so that the corrugations run spirally throughout the length of the tube.

§ 52.55-5 **Materials and workmanship.**

(a) Seamless steel boiler tubes shall comply with the requirements of subparts 51.25 and 51.31 for such tubes.

(b) Electric-resistance-welded steel and iron boiler tubes shall comply with the requirements of subpart 51.28 for such tubes.

(c) Lap-welded steel and wrought-iron boiler tubes shall comply with the requirements of subpart 51.25 for such tubes.

(d) The ends of tubes used in fire-tube boilers shall not extend more than $\frac{3}{8}$ inch beyond the tube sheet. All such tubes shall be rolled tight in the sheet and the ends shall be beaded over.

(e) (1) The ends of all tubes and nipples shall be expanded and flared not less than $\frac{1}{8}$ inch over the diameter of the tube hole on all water tube boilers and headers, or they may be flared not less than $\frac{1}{8}$ inch, rolled and beaded, or flared, rolled and seal welded, or rolled and seal welded without flaring provided the throat of the weld is not less than $\frac{3}{16}$ inch nor more than $\frac{3}{8}$ inch.

(2) The ends of tubes or nipples of water tube boilers when not seal welded shall project through the tube plates or headers not less than $\frac{1}{4}$ inch nor more than $\frac{1}{2}$ inch before flaring. When the tubes enter at an angle, the maximum limit of $\frac{1}{2}$ inch shall apply only at the point of least projection.

(3) If the tubes or nipples are welded, they shall be reexpanded to provide for shrinkage after welding. Welding shall be done by qualified welders using electrodes of a diameter not exceeding $\frac{9}{32}$ inch. Carbon content of the plate, headers, and tubes shall not exceed 0.35 percent and stress relieving shall not be used after welding.

(f) Spirally-fluted or corrugated seamless tubes may be used in connection with fire-tube or waste-heat boilers, provided they are attached to the tube sheets in the same manner as other tubes.

§ 52.55-10 Computations. (a) (1)

The maximum allowable pressure and minimum thickness of seamless and electric-resistance butt-welded carbon and alloy steel boiler and superheater tubes subject to internal pressure shall be computed by the following formulas:

(1) For low-carbon tubes:

$$P = \frac{20,700 (T - 0.04)}{D} - 300 \quad (1)$$

(2) For medium-carbon tubes:

$$P = \frac{27,600 (T - 0.04)}{D} - 400 \quad (2)$$

2.3.5T S

30

where:

P = Maximum allowable pressure, in pounds per square inch.

T = Minimum thickness of tube wall, in inches.

D = External diameter of tube, in inches.

S— Value in table 52.55-10 (a1) corresponding with operating temperature.

(2) No tube shall be allowed a pressure in excess of that permitted by formula (3) with the value of S taken from table 52.55-10 (a1), for the material from which the tubes are made, at a temperature not less than the maximum mean wall temperature of the tube, but not less than 750° F.

TABLE 52.55-10 (a1)—VALUES OF *S*—MAXIMUM ALLOWABLE STRESS

Type of material	Maximum operating temperatures °F			
	650	700	750	800
Grade A seamless	9,400	9,000	8,150	7,115
Grade A welded	8,000	7,650	6,950	6,100
Grade C welded	10,200	9,700	8,450	7,030
Grade D welded	9,000	7,650	7,300	6,700
Low carbon seamless	9,400	9,000	8,300	7,900
Medium carbon seamless	12,000	11,400	10,400	9,100
Grade Ti	11,000	11,000	10,750	10,500
Grade TiB	12,000	12,000	12,000	11,500
Grade TiB	10,600	10,600	10,600	10,400
Grade A seamless	8,850	4,400	2,600	---
Grade A welded	4,930	3,750	2,200	---
Grade C welded	5,400	3,750	2,200	---
Grade D welded	5,800	4,750	3,200	1,700
Low carbon seamless	6,800	5,500	3,800	2,000
Medium carbon seamless	7,400	5,500	3,800	2,000
Grade Ti	10,500	10,000	8,000	4,400
Grade TiB	11,000	10,000	8,000	4,400
Grade TiB	10,200	10,000	8,000	4,400

NOTE—Maximum allowable pressures for superheater tubes shall be the same as for boiler tubes.

(b) (1) The maximum allowable pressure and minimum thickness of seamless or welded boiler tubes less than 6 inches in diameter, and subject to external pressure, shall be computed by the following formulas:

$$P = \frac{14,000 (T - 0.065)}{D} \quad (4)$$

$$T = \frac{PD}{14,000} + 0.065 \quad (5)$$

where:
 P = maximum allowable pressure, in pounds
 per square inch.

T = thickness of tube, in inches.

D = external diameter of tube, in inches.

(2) As a matter of convenience, table 52.55-10 (b) has been computed from the preceding formulas.

TABLE 52.55-10 (b)—MAXIMUM ALLOWABLE PRESSURE AND MINIMUM THICKNESS FOR SEAMLESS OR WELDED BOILER TUBES LESS THAN 6" IN DIAMETER AND SUBJECT TO EXTERNAL PRESSURE

[illegible]

(c) The maximum allowable pressure and the minimum wall thickness for spirally-fluted seamless tubes shall comply with table 52.55-10 (c).

TABLE 52.55-10 (c)—MAXIMUM ALLOWABLE PRESSURE AND MINIMUM WALL THICKNESS FOR SPIRALLY-FLUTED SEAMLESS TUBES*

Nominal diameter, inches	Maximum allowable pressure, in pounds per square inch, and minimum wall thickness, in inches				
	0.116	0.128	0.144	0.160	0.176
2	100	140	195		
2 1/4	96	125	170	205	
2 1/2	80	115	155	195	
2 3/4	70	105	140	180	
3	60	90	125	165	195
3 1/4	50	85	115	150	180
3 1/2	45	75	105	140	170

§ 52.55-15 Detail requirements. (a) Seamless or electric-resistance butt-welded tubes shall be used in all construction where the tubes are subject to internal pressure.

(b) It shall be permissible to weld on safe ends or lengthen superheater tubes, provided that either the forge welding or electric-resistance butt-welding method is employed.

SUBPART 52.60—SUPERHEATERS, HEADERS,
WATER WALLS, AND ECONOMIZERS

§ 52.60-1 Definitions — (a) Super-

heaters. Superheaters, within the meaning of this subpart, are appliances for the purpose of increasing the temperature of steam.

(b) *Header*. Header is a hollow forging or casting, or a pipe, serving as a manifold to which tubes are connected.

(c) *Water wall.* Water wall is a series of tubes or elements spaced along or integral with a wall of a furnace to protect the wall and provide additional heating surface.

(d) *Economizer*. Economizer is a feed-water heater usually located in the uptake or casing of a boiler to absorb heat from the waste gases.

§ 52.60-5 Drawings and specifications. Manufacturers of superheaters, headers, water walls, and economizers, not previously approved, shall submit drawings and specifications to the Com-mandant, and such drawings and spec-ifications shall be approved by the Com-mandant before the appliances can be installed on vessels subject to inspec-tion by the Coast Guard.

§ 52.60-10 *Materials.* (a) Headers or fittings, used in connection with these appendances, shall be constructed of wrought steel, in accordance with the requirements of subpart 51.04, 51.34, or 51.37; or of wrought iron conforming to the requirements of subpart 51.43; or cast steel conforming with the requirements of subpart 51.58. Equivalent material may be used if approved by the Commandant. (See §§ 51.01-85 and 52.01-60.) Ends of headers may be closed by plugs conforming to the requirements of subpart 51.04 (class A material), or subpart 51.22 (class B material).

(b) Tubes used in the construction of superheaters shall conform to the requirements of subpart 51.25, 51.28, or 51.31.

§ 52.60-15 Computations. (a) The maximum allowable pressure of cylindrical headers shall be determined by formula (1), (2), or (3) of § 52.05-10.

(b) For flat surfaces of bronze, wrought iron, forged steel, or cast steel, the maximum allowable pressure and

minimum thickness shall be computed by the following formulas:

$$P = \frac{S(T - 0.094)^2}{D^2 C} \quad (1)$$

$$T = 0.094 + D \sqrt{\frac{CP}{S}} \quad (2)$$

where:

P = maximum allowable pressure, in pounds per square inch.

T = thickness, in inches.

S = minimum tensile strength of material, in pounds per square inch.

D = distance between supports of flat surface, in inches.

C = 0.7 for forged steel or wrought iron,

C = 0.9 for cast steel.

C = 1.8 for cast bronze.

(c) The maximum allowable pressure and minimum thickness of tubes shall be in accordance with the tables and formulas provided in subpart 52.55.

§ 52.60-20 *Detail requirements.* (a) Where superheaters are fitted in conjunction with water-tube boilers, they may be considered as a part of the boiler, provided the pipe between boiler and superheater and between superheaters is made of seamless steel pipe having a minimum thickness computed by the formula specified for piping in § 55.07-5 of this subchapter. Fittings used in making such connections shall be of forged or cast steel. Superheaters connected to the boiler drum by a number of tubes spaced along the drum may also be considered a part of the boiler. Under these conditions stop valves may be located at the combined outlet from the superheaters instead of on the boiler drum. The pipe connections shall be made as short as practicable to be consistent with proper provision for expansion.

(b) Superheater headers in which it is possible for water to accumulate shall be fitted with adequate means for draining the headers.

SUBPART 52.65—SAFETY VALVES

§ 52.65-1 *Definitions.* (a) *Safety valve.* Safety valve is a valve designed to open automatically to relieve excess pressure in the boiler or pressure vessel to which it is attached.

(b) *Spring loaded safety valve.* Spring loaded safety valve is a safety valve fitted with a spring to hold the valve against its seat and allows it to open at a given pressure. This term applies to pop safety valves of various forms.

(c) *Pressure loaded safety valve.* Pressure loaded pilot actuated safety valve is one which is held in the closed position by steam pressure and controlled in operation by a pilot actuator valve.

(d) *Spring loaded, pilot actuated safety valve.* Spring loaded, pilot actuated safety valve is one in which a spring is used in the conventional way to hold the disk against the seat, but which has a piston attached to the spindle and inclosed within a cylinder, which when subjected to a limiting or set pressure, unbalances the spring load thereby opening the valve.

(e) *Spring loaded pilot valve.* Spring loaded pilot valve is a conventional safety valve designed to actuate another spring loaded safety valve through a

pressure transmitting line led from the body of the pilot valve.

(f) *Lever safety valve.* Lever safety valve is a safety valve having the disk held on its seat by the action of a weight hung on a lever which is pivoted on a fulcrum.

(g) *Relief valve.* Relief valve is a valve constructed on the general design of safety valves to relieve excess pressure. It may be used for service where an approved safety valve is not required by the regulations of this subchapter. (See § 54.01-30 of this subchapter.)

§ 52.65-5 *General requirements.* (a) Each boiler shall be provided with one or more safety valves. Boilers of more than 500 square feet of water heating surface but without superheaters shall be fitted with at least two safety valves, and boilers with integral superheaters shall have at least two safety valves attached to the drum and one safety valve fitted to the superheater outlet. On river steam vessels whose boilers are connected in batteries without means of shutting off one boiler from another, each battery of boilers shall be treated as a single boiler and equipped with not less than two safety valves of equal size.

(b) Drum safety valves shall be set to relieve at a pressure not in excess of that allowed by the certificate of inspection. Where for any reason this is lower than the pressure for which the boiler was originally designed, an accumulation test, as provided for in paragraph (g) of this section, shall be conducted to insure that the relieving capacity of the safety valve is sufficient for the lower pressure.

(c) Each superheater shall be fitted with a safety valve installed on the outlet. The setting of the valve shall not exceed the design pressure of the machinery plus the pressure drop in the piping from the superheater outlet to the machinery. To prevent damage to the superheater, the drum safety valves shall be set at a pressure not less than that of the superheater safety valve setting plus 5 pounds minimum plus approximately the normal load pressure drop through the superheater. If there are no intervening valves between the superheater safety valve and the boiler, the relieving capacity of the superheater safety valve rated in accordance with the requirements of § 52.65-10 (c) may be included in determining the total required relieving capacity of the boiler provided the drum safety valves have at least 75 percent of the aggregate relieving capacity required. The foregoing requirements do not apply when drum pilot actuated superheater safety valves are used. Installations employing pilot actuated safety valves will be given special consideration by the Commandant.

(d) In the event the maximum steam generating capacity of the boiler is increased by any means, the relieving capacity of the safety valves shall be checked by an inspector and if determined to be necessary, valves of increased relieving capacity shall be installed.

(e) The total rated relieving capacity of drum and superheater safety valves as certified by the valve manufacturer shall not be less than the maximum generating capacity of the boiler as certified by

the boiler manufacturer. The safety valves shall be capable of discharging all the steam that can be generated without allowing the pressure to rise more than 6 percent above the set pressure of the valve.

(f) (1) The boiler manufacturer may certify the normal as well as the maximum generating capacity of the boiler. In the absence of such certification the minimum safety valve relieving capacity shall be determined upon the basis of the pounds of steam generated per hour per square foot of boiler heating surface and the water-wall heating surface, as given in the following table:

TABLE 52.65-5 (f) (1)—MINIMUM RELIEVING CAPACITY

Type of boiler	Minimum pounds of steam per hour per square foot of surface					
	Boiler heating surface			Water wall surface		
	Hand-fired	Stoker-fired	Oil or pulverized fuel-fired	Hand-fired	Stoker-fired	Oil or pulverized fuel-fired
Fire-tube.....	5	7	8	8	10	14
Water-tube.....	6	8	10	8	12	16

(2) In many cases a greater relieving capacity of safety valves must be provided than required by this paragraph, and in every case the requirements of paragraph (e) of this section shall be met.

(3) The heating surface shall be computed for that side of the boiler surface exposed to the products of combustion exclusive of the superheating surface. In computing the heating surface only the tubes, fireboxes, shells, tube sheets, and the projected area of the headers need be considered. For vertical fire-tube boilers, only that portion of the tube surface up to the middle gauge cock is to be computed. The minimum number and size of safety valves required shall be determined on the basis of the aggregate steaming capacity and the aggregate rated relieving capacity of the valves shall be in accordance with § 52.65-10 (c).

(g) An accumulation test shall be conducted in the presence of an inspector to determine the adequacy of protection provided by the aggregate relieving capacity of the boiler safety valves except in instances where possible damage to superheaters makes this impractical. During this test all steam outlet connections except the safety valves and such others as may be necessary to operate the boiler shall be closed and the fires forced to their maximum capacity for a period of 15 minutes for fire-tube boilers and 7 minutes for water tube boilers.

§ 52.65-10 *Detail requirements.* (a) On new installations the inlet diameter of a safety valve for power boiler drums, superheaters or unfired steam generators shall be not less than 1½ inches nor more than 4 inches. Safety valves of 4½-inch diameter inlet may be used for replacement on existing boilers or unfired steam generators. The foregoing diameters apply to the valve inlet.

(b) All safety valves shall be so constructed that the failure of any part cannot obstruct the free and full discharge of steam from the valve. Safety valves shall be of the direct spring-loaded pop type with seat inclined at any angle between 45° and 90°, inclusive, to the center line of the spindle or of such other types as may be approved by the Commandant. Valves having a discharge capacity equivalent to the full inlet area of the valve may be used provided the operating characteristics of the valve are such as not to induce lifting of the water from the boiler.

(c) The actual capacity of a safety valve shall be determined by test by steam flow through the valve in the conventional manner at a pressure of 3 percent in excess of that at which the valve is set to blow and adjusted to have a blow-down in accordance with the requirements of paragraph (h) of this section. The rated capacity, with which the valve will be credited, will be 90 percent of the actually developed flow through the valve.

(d) Lever or weighted safety valves now installed may be continued in use and may be repaired, but, when renewals are necessary, lever or weighted safety valves shall not be used.

(e) Safety valves intended for use on power boilers shall have flanged inlets and either flanged or screwed side outlets except outlets exceeding 4 inches in diameter shall be flanged. Safety valves with screwed inlets and screwed outlets may be used on heating boilers and unfired steam generators for pressures not exceeding 30 pounds per square inch without diameter limitation. Where the pressure exceeds 30 pounds per square inch safety valve inlets and outlets shall be as specified for power boilers.

(f) Manufacturers desiring to secure approval of a new design or type of safety valve for which capacity tests have not been conducted shall submit drawings in quadruplicate clearly showing the design of same together with the material specifications of the component parts. The design shall be approved prior to any safety valve being installed on vessels subject to inspection by the Coast Guard. In the event approval is granted by the Commandant, the manufacturer shall upon request furnish such additional copies of drawings as may be necessary for use of the field inspection offices. In the event the design is changed, amended drawings shall be submitted to the Commandant for approval.

(g) Manufacturers shall, in order to obtain approval, have tests conducted, or submit evidence that such tests have already been conducted and approved by or at the United States Naval Boiler and Turbine Testing Laboratory, the National Board of Boiler and Pressure Vessel Inspectors, or by properly supervised and inspected tests acceptable to the Commandant, relative to determining the lift, popping pressure, blow-down, and capacity of three different pressures for each of three representative sizes of each design or type of safety valve proposed for use on marine boilers. Reports of conducted tests on designs different from those already approved

shall be submitted by the manufacturer when such designs are intended for installations on vessels subject to inspection by the Coast Guard. A table of relieving capacities for each size of valve for which approval is requested shall also be submitted. A coefficient of discharge shall be determined for each test as follows:

$$K = \frac{\text{Actual steam flow}}{\text{Theoretical steam flow}} \quad (1)$$

The average coefficient, K , of the nine tests shall be taken as the coefficient of the design and shall be used for determining the relieving capacity for all sizes and pressures of the design of seat as used in the following formulas:

For 45° seat:

$$W = (51.45 \times \pi \times DLP \times 0.707 \times K) 0.90 \quad (2)$$

For flat seat:

$$W = (51.45 \times \pi \times DLP \times K) 0.90 \quad (3)$$

For nozzle:

$$W = (51.45 \times AP \times K) 0.90 \quad (4)$$

where:

W —Weight of steam, pounds per hour.¹

D —Seat diameter, in inches.

L —Lift, in inches.

P — $(1.03 \times \text{set pressure}) + 14.7$ —absolute pressure, in pounds per square inch.

K —Average coefficient of discharge.

A —Nozzle throat area, in square inches.

(h) Safety valves shall operate without chattering and shall be set and adjusted as follows:

(1) For pressures of 100 pounds per square inch and below to close after blowing down not more than 4 percent, but not less than 2 pounds. The valve shall be adjusted to pop within 1 pound of the set pressure stamped upon the valve. After the valve is set and adjusted a variation tolerance in popping and reseating pressures of plus or minus 2 pounds from the set pressure stamped on the valve is permissible.

(2) For pressures above 100 pounds per square inch to close after blowing down not more than 4 percent, but not less than 2 percent. The valve shall be adjusted to pop within 1 percent of the set pressure stamped upon the valve. After the valve is set and adjusted a variation tolerance in popping and reseating pressures of plus or minus 1 percent for saturated steam service and 1½ percent for superheated steam service is permissible.

(3) Safety valves for use on forced circulation boilers of the once through type may be set and adjusted to close after blowing down not more than 10 percent of the set pressure. For pressures of 70 pounds per square inch and below after the valve is set and adjusted a variation tolerance of plus or minus 2 pounds from the set pressure stamped on the valve is permissible. For pressures exceeding 70 pounds per square inch but not exceeding 300 pounds per square inch after the valve is set and adjusted a variation tolerance of plus or minus 3 percent from the set pressure stamped on the valve is permissible. For pressures exceeding 300 pounds per square inch after the valve is set and

¹ The theoretical steam flow is calculated in accordance with Napier's formula.

adjusted, a variation tolerance of plus or minus 10 pounds from the set pressure stamped on the valve is permissible. The superheater protection required by § 52.65-5 (c) shall be provided within the permissible popping tolerance.

(4) (1) Springs used in safety valves shall be of the best quality spring steel consistent with the design of the valve and the service requirement; however, heat resisting alloy steel springs shall be used on valves intended for superheater service above 650° F. Springs shall not show a permanent set exceeding 1 percent of their free length 10 minutes after being released from a cold compression test closing the spring solid.

(2) The spring shall be so constructed that the disk can lift from its seat to a height not less than 25 percent greater than the rated capacity lift of the valve before the coils are closed or before there is other interference. Whenever lift stops are used by the manufacturer for the purpose of preventing overlift they shall in all instances permit the full-rated capacity lift plus a minimum tolerance of ¼ inch.

(3) The valve manufacturer shall securely attach to the valve a data plate on which shall be stamped the spring number and the minimum and maximum pressure to which the spring may be adjusted. When it becomes necessary to permanently adjust the valves beyond the limits indicated, a new spring suitable for the new pressure shall be installed.

(4) Springs of boiler safety valves shall be of the exposed spring type when the temperature of the steam exceeds 450° F. Exposed springs shall be enclosed in a ventilated metal housing and sealed to prevent tampering.

(j) Bodies of safety valves may be made of forged steel, cast steel, or of such other material as may be approved by the Commandant. When the steam pressure and temperature do not exceed 300 pounds per square inch or 450° F., bodies of safety valves may be made of bronze. When the steam pressure does not exceed 30 pounds per square inch, bodies of safety valves may be made of cast iron.

(k) Disks, seats, guides, adjusting rings, stems, etc., shall be made of materials possessing corrosion and heat resisting qualities suitable for the service conditions to which they are subjected.

(1) Each safety valve shall be plainly marked by the manufacturer in such a way that the markings will not be obliterated in service. The markings may be stamped on the body, or stamped or cast on a plate securely fastened to the body, and shall contain the following information:

- (1) The name of manufacturer -----
- (2) In upper right-hand corner shall be placed the Coast Guard stamp. (See figure 51.01-60 (b).)
- (3) Manufacturer's design or type number -----
- (4) Size ----- in. Seat diameter ----- in.
(The pipe size of the valve inlet)
- (5) Pressure ----- p. s. i. ----- p. s. i.
(Body primary service pressure rating—set pressure)
- (6) B. D. ----- p. s. i.
(Blow-down—difference between the opening and closing pressure)

- (7) Capacity ----- lbs. per hour
(In accordance with paragraph (g),
and with the valve adjusted for the
blow-down given in paragraph (h) of
this section)
- (8) Capacity lift ----- in.
(Capacity lift—distance the valve disk
rises under the action of the steam
when the valve is blowing under a pres-
sure of 3 percent above the set pres-
sure)

§ 52.65-15 *Installation.* (a) The final setting of boiler safety valves shall be checked and adjusted under steam pressure by an inspector who upon acceptance shall seal the valves. This requirement applies to drum and also superheater safety valves when the latter provide part of the required relieving capacity for the boiler.

(b) Except in the case of superheater valves, safety valves are not to be connected to any fitting with outlets for any purpose other than the escape of steam through the safety valve. They shall be connected directly to the boiler or as close thereto as possible and installed in an upright position with spindles vertical except in the case of especially designed and approved valves.

(c) No valves shall be placed between the required safety valves and the boiler or unfired steam generator nor in the escape pipe between the safety valve and atmosphere.

(d) Twin valves, made by placing individual valves on Y bases, or duplex valves having two valves in the same body, shall be of equal size.

(e) (1) To insure the valve being free, each safety valve shall have a substantial lifting device by which the valve disk may be positively lifted from its seat when there is at least 75 percent of full working pressure on the boiler. The lifting device shall be such that it cannot lock or hold the valve disk in lifted position when the exterior lifting force is released. Such mechanism shall be connected by suitable relieving gear so arranged that controls may be operated from the fire-room or engine-room floor.

(2) When, due to high pressure, it is impracticable to fit a relieving gear to raise the safety valve from its seat in order to relieve the boiler of pressure, suitable piping and a valve having a relieving capacity of not less than the safety valves(s), may be connected from the boiler to the escape pipe or condenser. The valve shall be arranged to permit operation from the fire-room or engine-room floor.

(f) Escape piping from the boiler drum and superheater valves shall have an area not less than that of the combined areas of the outlets of all valves discharging thereto and shall be led upward as directly as possible without pockets. Expansion joints or flexible connections adequately supported and so installed that no stress is transmitted to the safety valve body shall be provided with low points of escape piping adequately drained.

(g) Steel, iron, or bronze valves, 1½-inch size, shall be tapped for not less than ¼-inch pipe size drain with drain connection located below the level of the seat. Steel, iron, or bronze safety valves, 2-inch size and larger, shall be tapped

for not less than ¾-inch pipe size with drain connection located below the level of the seat. No shut-off valve shall be fitted in the drain pipe.

(h) All safety valves for use on boilers and superheaters shall be supplied with gags or clamps for holding the disk on its seat when blow-down adjustments are made and when hydrostatic tests are being applied. The gags or clamps shall be carried on board the vessel at all times. Gaging a safety valve by means of a set screw through the top of the casing or by screwing down the compression or adjusting screw to hold the valve on its seat is prohibited.

SUBPART 52.70—BOILER MOUNTINGS AND ATTACHMENTS

§ 52.70-1 *Definitions.*—(a) *Mountings.* Mountings, within the meaning of the regulations in this subchapter, are connections, distance pieces, valves, or fittings attached directly to the boiler.

(b) *Main stop valve.* Main stop valve is a valve usually connected directly to the boiler for the purpose of shutting off the steam from the main steam line.

(c) *Auxiliary stop valve.* Auxiliary stop valve is a valve usually connected directly to the boiler for the purpose of shutting off the steam from the auxiliary lines (including the whistle lines).

(d) *Manifold.* Manifold is a fitting with two or more branches having valves either attached by bolting or integral with the fitting.

(e) *Feed valve.* Feed valve is a valve in the feed-water line which controls the boiler feed.

(f) *Blow-off valve.* Blow-off valve is a valve connected directly to the boiler for the purpose of blowing out water, scum, or sediment.

(g) *Dry pipe.* Dry pipe is a perforated or slotted pipe placed in the highest part of the steam space of a boiler to prevent priming.

(h) *Water column.* Water column is a fitting or tube equipped with a water glass attached to a boiler for the purpose of indicating the water level.

(i) *Test cocks.* Test cocks are small cocks on a boiler for indicating the water level.

(j) *Salinometer cocks.* Salinometer cocks are cocks attached to a boiler for the purpose of drawing off a sample of water for salinity tests.

(k) *Fusible plugs.* Fusible plugs are plugs made with a bronze casing and a tin filling which melts at a temperature of 450° to 500° F. They are intended to melt in the event of low water and thus warn the engineer on watch.

§ 52.70-5 *Materials and workmanship.* (a) Boiler mountings or attachments shall be made of steel forgings conforming to the requirements of subpart 51.46; steel castings conforming to the requirements of subpart 51.58; or, where the temperature does not exceed 450° F., they may be made of bronze castings conforming to the requirements of subpart 51.76.

(b) Where the temperature exceeds 450° F., bolting material shall conform to the requirements of subparts 51.49 and 51.55. Where the temperature does

not exceed 450° F., carbon steel bolting material conforming to the requirements of subpart 51.52 may be used.

(c) The use of cast iron for mountings, fittings, valves, or cocks, attached directly to boilers operating at pressures exceeding 30 p. s. i. is prohibited.

§ 52.70-10 *Detail requirements.* (a) Boiler mountings and attachments having diameters of 1½ inches and over, shall be fitted with flanged ends and be bolted directly to the boiler.

(b) Where bolt holes extend through the plating of a boiler or pressure vessel, the plate shall be threaded to receive the bolt. The bolt head, or, in the case of stud bolts, a nut with washer and grommet shall be fitted on the inside. Where stud bolts are used, with the holes not extending through the plate, the stud shall be screwed into the plate a distance at least equal to the diameter of the stud over the threads.

(c) Where pipes are screwed into the plating of the boiler, the minimum number of pipe threads permitted shall be in accordance with the following table:

TABLE 52.70-10 (c)—MINIMUM NUMBER OF PIPE THREADS FOR CONNECTIONS TO BOILER

Size of pipe connection, inches.....	1 and 1¼
Number of threads per inch.....	11½
Minimum number of threads required in opening.....	4
Minimum thickness of material required to give above number of threads (inches).....	0.348

§ 52.70-15 *Main and auxiliary stop valves.* (a) All valves shall be marked as specified in § 55.07-10 (f) of this subchapter.

(b) All valves shall close with a right-hand motion of the wheel when facing the end of the stem. Stop valves of the globe or similar type shall be installed to seat against the pressure, and shall be designed to indicate at a glance whether they are opened or closed.

(c) Where the diameter of stop valves exceeds 6 inches, they shall be fitted with bypass valves for the purpose of heating the line and equalizing the pressure before opening the valves.

(d) Inspectors are required to carefully examine all steam lines to satisfy themselves that adequate and dependable drainage is provided to prevent an accumulation of water in the piping.

§ 52.70-20 *Manifolds.* Manifolds shall comply with the requirements for other mountings or fittings specified in § 52.70-15.

§ 52.70-25 *Feed valves.* (a) Feed stop valves shall be attached directly to boilers not fitted with economizers. If the installation will not permit direct attachment, fittings made as short as practicable may be employed. Boilers fitted with economizers shall have a non-return valve fitted between the steam drum and the economizer.

(b) Feed lines shall be provided with a check valve adjacent to the feed stop valve. An approved feed water regulator may be interposed between the check and the stop valve.

(c) Two separate means shall be provided for supplying feed water except for small donkey boilers and installations in which the unit feed system is em-

ployed. Where practicable the feed connections shall be through separate nozzles.

(d) (1) When the unit feed system is employed each boiler shall have its own independently driven main feed pump capable of supplying the boiler at its normal operating capacity. In addition there shall be an auxiliary independently driven feed pump of the same capacity which can be operated in place of and in conjunction with the main feed pump. In vessels with two boilers there shall be one auxiliary pump for each boiler. In vessels with three or more boilers, not more than two boilers may be served by any one auxiliary pump. The auxiliary pump may be so interconnected that any pump can feed any boiler.

(2) A separate feed line shall be provided for each boiler from its pumps. A separate auxiliary feed line is not required in the unit feed system. The discharge from each pump and the feed supply to each boiler shall be automatically controlled by the level of the water in that boiler. In addition to the automatic control, manual control shall be provided.

(e) Feed water heaters, grease extractors, and feed water regulators, where installed, shall be fitted with bypasses. Economizers forming an integral part of the boilers are not required to be so fitted. Feed water regulator bypasses shall be fitted with stop check valves, or combined stop check valves, or shall be so arranged that the regular stop check valves are in operation while the bypass is in use.

(f) Feed water shall not be discharged into a boiler against surfaces exposed to hot gases, to the radiant heat of the fire, or close to a riveted joint.

(g) Feed water nozzles shall be fitted with a sleeve or other suitable means to reduce the effects of metal temperature differentials in the shells or heads for design pressures of 400 pounds per square inch or over.

§ 52.70-30 *Blow-off valves.* (a) Boilers shall be fitted with a surface and a bottom blow-off valve or cock attached directly to the boiler or to a distance piece. The surface blow-off valve shall be located within the permissible range of the water level, or fitted with a scum pan or pipe at this level. The bottom blow-off valve shall be attached to the lowest part of the boiler or fitted with an internal pipe leading to the lowest point inside the boiler. Water-tube boilers designed for working pressures of 350 pounds per square inch or over are not required to be fitted with a surface blow-off valve.

(b) Where blow-off pipes are exposed to direct heat from the fire, they shall be protected by fire brick or other suitable heat-resisting material.

(c) Where such blow-off valves are connected to a common discharge from two or more boilers, a nonreturn valve shall be provided in the pipe from each boiler to prevent accidental blowback in case the blow-off valve is left open.

§ 52.70-35 *Dry pipes.* Internal dry pipes may be fitted to stop valves and safety valves, provided such dry pipes have a wall thickness at least equal to

standard commercial pipe thickness for their diameter. The area of the opening in such dry pipes shall be at least twice the nominal area of the dry pipe. Openings in dry pipes shall be as near as practicable to the valve and shall be slotted or drilled, the width of the slots to be not less than $\frac{1}{4}$ inch, or the diameter of the holes to be not less than $\frac{3}{8}$ inch. Where dry pipes are used, they shall be provided with drains at each end to prevent an accumulation of water.

§ 52.70-40 *Fusible plugs.* (a) All boilers, except water-tube boilers, and low-pressure heating boilers operating at pressures not in excess of 30 pounds per square inch, shall be fitted with fusible plugs manufactured from acceptable heats in accordance with subpart 57.25.

(b) Vertical boilers shall be fitted with one fusible plug located in a tube not more than 2 inches below the lowest gauge cock.

(c) Externally fired, cylindrical boilers, with flues, shall have one plug fitted to the shell immediately below the fire line not less than 4 feet from the front end.

(d) Firebox, Scotch, and other types of shell boilers not specifically provided for, having a combustion chamber common to all furnaces, shall have one plug fitted at or near the center of the crown sheet of the combustion chamber.

(e) Double-ended boilers having individual combustion chambers for each end which combustion chambers are common to all the furnaces in one end of the boiler, shall have one plug fitted at or near the center of the crown sheet of each combustion chamber.

(f) Boilers constructed with a separate combustion chamber for each individual furnace shall be fitted with a fusible plug in the center of the crown sheet of each combustion chamber.

(g) Boilers of types not herein provided for shall be fitted with at least one fusible plug of such dimensions and located in a part of the boiler as will, in the judgment of the inspector, best meet the purposes for which it is intended.

(h) Fusible plugs shall be so fitted that the smaller end of the filling is in direct contact with the radiant heat of the fire, and shall be at least 1 inch higher on the water side than the plate or flue in which they are fitted, and in no case more than 1 inch below the lowest permissible water level as defined in paragraph (i).

(i) The lowest permissible water level shall be determined as follows:

(1) Vertical fire-tube boilers, one-half of the length of the tubes above the lower tube sheets.

(2) Vertical submerged tube boiler, 1 inch above the upper tube sheet.

(3) Internally-fired fire-tube boilers with combustion chambers integral with the boiler, 2 inches above the highest part of the combustion chamber.

(4) Horizontal-return tubular and dry back Scotch boilers, 2 inches above the top row of tubes.

(5) The lowest permissible water level for all water-tube boilers shall be determined at the time drawings of the boilers are submitted for approval.

(j) Fusible plugs shall be cleaned and will be examined by the inspector at each annual inspection, and oftener if necessary, and if, in the inspector's opinion, the condition of the plugs is satisfactory, they may be continued in use.

(k) Fusible plugs shall not be permitted where the maximum steam temperature to which they are exposed exceeds 425° F.

§ 52.70-45 *Pressure gauges.* (a) Each single-ended boiler shall be fitted with a reliable steam gauge, the dial of which shall be graduated to approximately double the pressure at which the safety valve is set, but in no case less than one and one-half times this pressure. Each double-ended boiler shall be fitted with two such pressure gauges, one on either end of the boiler. Gauges shall be located where they can be easily seen.

(b) The error in reading at any point to the maximum reading to which the scale is graduated, shall not exceed $1\frac{1}{2}$ percent of the maximum reading to which the scale is graduated; except that the error in reading at the graduation indicating the working pressure shall not exceed one-half of 1 percent of the maximum reading to which the scale is graduated.

§ 52.70-50 *Water indicators.* (a) Each boiler shall have two independent means of indicating the water level in the boiler, one of which shall be a gauge glass. The secondary indicator may consist of a gauge glass, or other device approved by the Commandant, or where the allowable steam pressure does not exceed 250 pounds per square inch, three test cocks attached directly to the head or shell of the boiler. Where the allowable pressure exceeds 250 pounds per square inch, the gauge glasses shall be of the flat type instead of the common tubular type.

(b) Glass water gauges shall be so located that the lowest visible part of the glass is not lower than the lowest permissible water level, as determined by § 52.70-40 (i). The lowest gauge cock shall be located 2 inches higher than the lowest visible part of the gauge glass, except that for horizontal boilers 48 inches or less in diameter they may be located at the lowest permissible water level.

(c) Double-ended fire-tube boilers shall be equipped as specified in paragraphs (a) and (b), except that a water-gauge glass, and three water-gauge cocks shall be installed on each end of the boiler.

(d) Externally fired flue boilers, such as are used on central western river vessels, shall be equipped as specified in paragraphs (a) and (b), except that float gauges may be substituted for gauge glasses.

(e) Gauge glasses shall be fitted with shut-off valves or cocks at the top and bottom and shall have valved drains.

(f) When water columns are provided, they shall be fitted to the heads or shells of boilers or drums with shut-off valves attached directly to the boilers or drums, or if necessary, connected thereto by a distance piece both at the top and bottom of the water columns. Water column

pipings shall not be fitted inside the uptake, the smoke box, or the casing.

§ 52.70-55 *Salinometer cocks.* In vessels operating in salt water, each boiler shall be equipped with a salinometer cock or valve which shall be fitted directly to the boiler in a convenient position. They shall not be attached to the water gauge or water column.

PART 53—LOW-PRESSURE HEATING BOILERS

SUBPART 53.01-1—STEEL-PLATE BOILERS

Sec.

53.01-1 Scope.

SUBPART 53.05—CAST-IRON BOILERS

53.05-1 Scope.

53.05-5 Manufacturer's certification.

53.05-10 Material.

53.05-15 Washout openings.

53.05-20 Flanged connections.

53.05-25 Threaded openings.

53.05-30 Hydrostatic tests.

53.05-35 Marking.

53.05-40 Installation.

53.05-45 Fittings and appliances.

AUTHORITY: §§ 53.01-1 to 53.05-45, inclusive, issued under R. S. 4405, 4417a, 4418, 4426, 4427, 4429, 4430, 4431, 4432, 4433, 4434, 4453, and 4491, as amended, sec. 14, 29 Stat. 690, 41 Stat. 305, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 363, 366, 367, 375, 391a, 392, 404, 405, 407, 408, 409, 410, 411, 412, 435, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.

SUBPART 53.01—STEEL-PLATE BOILERS

§ 53.01-1 *Scope.* Low-pressure steel-plate boilers used exclusively for steam heating and hot-water supply, the maximum allowable pressure of which shall not exceed 30 pounds per square inch, shall be designed and constructed in accordance with the applicable requirements specified in this part for cast-iron boilers, and as may be authorized by the Commandant.

SUBPART 53.05—CAST-IRON BOILERS

§ 53.05-1 *Scope.* (a) Cast-iron heating boilers may be used on vessels subject to inspection by the Coast Guard if constructed in accordance with the regulations in this part.

(b) Such boilers shall in no case be used for a maximum allowable pressure exceeding 15 pounds per square inch and shall be used exclusively for heating purposes.

§ 53.05-5 *Manufacturer's certification.* Each manufacturer desiring to construct cast-iron boilers for use on vessels subject to inspection by the Coast Guard shall submit an affidavit on form CG 935A, certifying that such boilers will comply with all of the requirements of the regulations in this subchapter.

§ 53.05-10 *Material.* The material used in the construction of cast-iron heating boilers shall conform to the requirements of subpart 51.64 for grade B or grade C material.

§ 53.05-15 *Washout openings.* All cast-iron heating boilers shall be provided with washout openings to permit the removal of any sediment that may accumulate therein. Washout openings

may be used for return pipe connections and the washout plug placed in a tee so that the plug is directly opposite and as close as possible to the opening in the boiler.

§ 53.05-20 *Flanged connections.* Flanged pipe connection openings in boilers shall conform to the American Standard given in table 55.07-15 (J1) for the corresponding pipe size, and shall have the corresponding drilling for bolts or studs.

§ 53.05-25 *Threaded openings.* Pipe connections if threaded shall be tapped into material having a minimum thickness as specified in table 53.05-25.

TABLE 53.05-25—MINIMUM THICKNESS OF MATERIAL FOR THREADED CONNECTIONS TO BOILERS

Size of pipe connections, inches:	Minimum thickness of material required, inches
¾ and under.....	⅝
1 to 2½, inclusive.....	⅞
3 to 3½, inclusive.....	⅞
4 to 5, inclusive.....	⅞
6 to 8, inclusive.....	1
9 to 12, inclusive.....	1¼

§ 53.05-30 *Hydrostatic tests.* (a) The completed boiler shall be subject to a hydrostatic test pressure of not less than 60 pounds per square inch. In the event of any defects developing, the defective portion may be replaced and the boiler retested, but defective sections shall not be repaired unless the same are first examined by an inspector and the method of repair is sanctioned by him.

(b) It is not required that inspectors make a shop inspection of each individual boiler. Such inspection shall be made by the manufacturers and certified to by them.

§ 53.05-35 *Marking.* Manufacturers shall stamp the completed boiler in an accessible location where the stamp marks will not be obliterated. In addition, a name plate shall be placed outside of the covering, giving the name of the manufacturer, the serial number of the boiler, and the letters, U. S. C. G.

§ 53.05-40 *Installation.* (a) Provisions shall be made for the expansion and contraction of steam mains to boilers by providing substantial anchorage at suitable points, so that there shall be no undue strain transmitted to the boiler.

(b) When feed or make-up water is introduced from a pressure line, it shall be connected to the piping system and not directly to the boiler.

(c) When a stop valve is used in the supply-pipe connection of a single boiler, there shall be one used in the return-pipe connection. It is recommended that no stop valves be placed in the supply and return pipe connections of a single boiler installation.

(d) A stop valve shall be used in each supply and return pipe connections of two or more boilers connected to a common system.

(e) Provision shall be made for cleaning the interior of the return piping at or close to the boiler.

(f) When stop valves are used they shall be properly designated substantially as indicated below by tags of metal or other durable material fastened to them.

Supply Valve—Number ()
Do Not Close Without Also Closing
Return Valve—Number ()

Return Valve—Number ()
Do Not Close Without Also Closing
Supply Valve—Number ()

(g) When a valve is placed in the top connection from a hot-water supply boiler to a storage tank, an additional connection without valve shall be made between the boiler and top of storage tank.

(h) Every boiler shall have proper outlet connections for the required safety valves, independent of any other connection outside the boiler. A steam-equalizing pipe between boilers is not to be considered as a connection outside of the boiler in applying the requirements of this paragraph. The area of the opening is to be at least equal to the aggregate area based on the nominal diameters of all of the safety valves with which it connects. A screwed connection may be used for attaching a safety valve.

§ 53.05-45 *Fittings and appliances—*

(a) *Safety valves.* (1) Each steam boiler shall be provided with one or more safety valves of the spring pop type adjusted and sealed to discharge at a pressure not to exceed 15 pounds per square inch. The minimum diameter of a safety valve shall not be less than ¾ inch, nor the maximum greater than 4½ inches.

(2) When two or more safety valves are used on a boiler, they may be single, twin, or duplex valves.

(3) Safety valves shall be connected to the boilers independent of other connections and be attached directly or as close as possible to the boiler without any unnecessary intervening pipe or fitting except the Y base forming a part of the twin valve or a steam-equalizing pipe between boilers. A safety valve shall not be connected to an internal pipe in the boiler. Safety valves shall be connected so as to stand upright with the spindle vertical.

(4) No shut-off of any description shall be placed between the safety valve and the boiler, nor on discharge pipes between such valves and the atmosphere.

(5) When a discharge pipe is used its area shall be not less than the area of the valve or aggregate area based on the nominal diameters of the valves with which it connects, and the discharge pipe shall be fitted with an open drain to prevent water from lodging in the upper part of the valve or in the pipe. When an elbow is located in a safety valve discharge pipe, it shall be located close to the valve outlet or the pipe shall be securely anchored and supported. The safety valves shall be so located and piped that there will be no danger of scalding operating personnel.

(6) Each safety valve, ¾ inch or over, used on a steam-heating boiler, shall have a substantial lifting device by which

the valve may be raised from its seat at least $\frac{1}{16}$ inch when there is no pressure on the boiler.

(7) Each safety valve shall be plainly marked by the manufacturer in such a way that the markings will not be obliterated in service, by stamping or casting on the casing or body of the valve, or by stamping or casting on a plate securely fastened to the casing, the letters U. S. C. G., the manufacturer's name or trade-mark, and the pressure at which it is set to blow. All safety valves shall be arranged so that they cannot be reset to relieve at a higher pressure than the maximum allowable pressure of the boiler. The seats and disks of safety valves shall be made of nonferrous material.

(8) The diameter of seat shall determine the nominal diameter of safety valve as given in table 53.05-45 (a). The pipe thread at the inlet shall not be less than the nominal valve size.

Where grate area does not exceed 4 square feet:

$$\text{Diameter of safety valve, inches} = \frac{\text{grate area, square feet}}{4}$$

Where grate area exceeds 4 square feet

$$\text{Diameter of safety valve, inches} = \frac{\text{grate area, square feet}}{10} + 0.6$$

If liquid or gaseous fuel is used a grate area should be assumed equal to that which would be required if coal were used for fuel.

(9) (i) The minimum size of safety valve or valves for each boiler shall be governed by the amount of the grate area as given in table 53.05-45 (a). In determining the minimum size of safety valves for double-grate down-draft boilers, the effective grate area shall be taken as the area of the upper grate plus one-eighth of the area of the lower grate.

(ii) The safety valve capacity for each steam boiler shall be such that the safety valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 5 pounds above the maximum allowable pressure of the boiler.

(10) When the size of boiler exceeds the values given in table 53.05-45 (a), safety valves whose combined capacities equal the rated capacity of the boiler shall be selected.

(11) When a hot-water supply is heated indirectly by steam in a coil or pipe, the pressure of the steam used shall not exceed the maximum allowable pressure of the hotwater tank, and a water-relief valve of at least 1 inch in diameter, set to relieve at or below the maximum allowable pressure of the tank, shall be used.

(b) *Steam gauges.* (1) Each steam boiler shall have a steam gauge connected to its steam space or to its water column, or its steam connection, by means of a siphon or equivalent device exterior to the boiler and of sufficient capacity to keep the gauge tube filled with water, and so arranged that the gauge cannot be shut off from the boiler except by a cock with T or lever handle, placed in the pipe near the gauge. The handle of the cock shall be parallel to the pipe in which it is located when the cock is open.

(2) The scale on the dial of a steam boiler gauge shall be graduated to not

TABLE 53.05-45 (a)—MINIMUM ALLOWABLE SIZES OF SAFETY VALVES FOR STEAM HEATING BOILERS

Safety valve			Area of grate
Diameter (inches)	Area	Discharge capacity ¹	
	Square inches	Pounds per hour	Square feet
$\frac{1}{4}$	0.0491	15	1
$\frac{3}{8}$	.1104	30	1.8
$\frac{1}{2}$	.1963	60	2
$\frac{3}{4}$	.4418	130	3
1	.7854	230	4
1 $\frac{1}{4}$	1.2272	360	6.5
1 $\frac{1}{2}$	1.7671	515	9
2	3.1416	920	14
2 $\frac{1}{2}$	4.9087	1,435	19
3	7.0686	2,070	24
3 $\frac{1}{2}$	9.6211	2,810	29
4	12.5660	3,675	34
4 $\frac{1}{2}$	15.9040	4,650	39

¹ Capacity of safety valve based on $3\frac{3}{4}$ percent over pressure, valve set to relieve at 15 pounds per square inch.

NOTE: The foregoing table is based upon the following formulas:

less than 30 p. s. i. The gauge shall be provided with effective stops for indicating pointer at the zero point and at the maximum pressure point. The travel of the pointer from zero to 30 p. s. i. shall be at least 3 inches.

(3) Steam-gauge connections shall be of nonferrous composition when smaller than 1-inch pipe and longer than 5 feet between the gauge and point of connection of pipe to boiler, and also when smaller than $\frac{1}{2}$ -inch pipe and shorter than 5 feet between the gauge and point of connection of pipe to boiler.

(4) On a compound gauge, effective stops shall be set at the limits of the gauge readings on both the pressure and vacuum sides.

(c) *Bottom blow-off.* Each boiler shall have a blow-off pipe connection fitted with a valve or cock not less than $\frac{3}{4}$ -inch pipe size connected with the lowest water space practicable.

(d) *Water-gauge glasses.* Each steam boiler shall have one or more water-gauge glasses, with the lower fitting provided with a valve or pet cock to facilitate cleaning.

(e) *Gauge cocks.* Each steam boiler shall have two or more gauge cocks located within the range of the visible length of the water glass.

(f) *Water-column pipes.* The minimum size pipes connecting the water column of a steam boiler shall be 1 inch. Water glasses, fittings, or gauge cocks may be connected directly to the boiler. No connections, except for combustion regulator, drain or steam gauge, shall be attached to the water column or the piping connecting a water column to a boiler. If the water column or gauge glass is connected to the boiler by pipe and fittings, a crosstee, or equivalent, in which a drain valve and piping may be attached, shall be placed in the water piping connection at every right-angle turn to facilitate cleaning.

(g) *Low-water fuel supply cut-off.* It is recommended that on all automatically fired steam or vapor-steam boilers, a low-water fuel-supply cut-off be installed in such location that it automatically shuts off the fuel supply when the surface of the water falls to the lowest safe water line.

(h) *Fusible plugs.* None required.

PART 54—UNFIRED PRESSURE VESSELS

Sec.	
54.01-1	Scope.
54.01-5	Approval.
54.01-10	Definitions.
54.01-15	Materials and workmanship.
54.01-20	Computations.
54.01-25	Evaporator safety valves.
54.01-27	Water level indicator, pressure gauge, and blow-down valve.
54.01-30	Relief valves.
54.01-35	Inspection.
54.01-40	Hydrostatic tests.
54.01-45	Markings.
54.01-50	Foreign-built pressure vessels.
54.01-55	Bolting.

AUTHORITY: §§ 54.01-1 to 54.01-55, inclusive, issued under R. S. 4405, 4417a, 4418, 4420, 4427, 4429, 4430, 4431, 4432, 4433, 4434, 4453, and 4491, as amended, sec. 14, 29 Stat. 690; 41 Stat. 305, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 363, 366, 367, 375, 391a, 392, 404, 405, 407, 408, 409, 410, 411, 412, 435, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.

§ 54.01-1 *Scope.* (a) The regulations in this part contain detail requirements for the design and fabrication of unfired pressure vessels subject to inspection by the Coast Guard.

(b) Unfired pressure vessels shall comply with the applicable requirements of part 52 of this subchapter except as provided otherwise in this part.

§ 54.01-5 *Approval.* Pressure vessels subject to inspection by the Coast Guard as required by § 54.01-35, heat exchangers, evaporators, and similar appliances shall be approved by the Commandant. Before approval will be granted, the manufacturer shall submit detailed drawings listing material specifications to the Commandant.

§ 54.01-10 *Definitions.*—(a) *Unfired pressure vessel.* An unfired pressure vessel is a tank containing gas, vapor, or liquid, or a combination thereof, under pressure, and not exposed to the products of combustion.

(b) *Heat exchanger.* A heat exchanger is a device usually consisting of a shell and tubes or coils by which heat is transferred from one substance to another.

§ 54.01-15 *Materials and workmanship.* (a) Equipment covered by this part constructed of plates with riveted joints, welded joints, or brazed joints shall conform to all the requirements of Part 52 of this subchapter for such construction.

(b) Unfired pressure vessels and appurtenances covered by this part may be fabricated of steel plate, cast steel, bronze, malleable iron, or cast iron. (For limitations as to pressure and temperature for bronze, malleable iron, and cast iron see §§ 55.07-1 (k) and 55.07-1 (l) of this subchapter.)

(c) Cast iron shall not be used in the construction of shells and heads of pressure vessels where subject to steam pressures exceeding 30 pounds per square inch or where subject to gas or liquid pressures exceeding 125 pounds per square inch. Cast iron is permitted for pressures not exceeding 125 pounds per square inch and temperatures not exceeding 450° F. for ordinary valves, flanges, and pipe fittings. Cast iron is not permitted for use in the construction of bodies and pressure parts of safety valves where subject to pressures exceeding 30 pounds per square inch.

(d) Flanges cast integral with shells or heads shall have a fillet with a radius not less than the thickness of the necks to which they are attached.

(e) The corner radius of a cast unstayed dished head measured on the concave side of the head shall be not less than three times the thickness of the head, but in no case less than 6 percent of the outside diameter of the shell.

(f) Where manholes or other large openings are provided in castings, the structure adjacent to the openings shall be reinforced by increasing the thickness of the material around the opening, or by ribs or webs to compensate for the material omitted in the opening. The corners of rectangular openings shall have fillets with radii not less than the thickness of the body of the material.

§ 54.01-20 *Computations.* (a) The maximum allowable pressure of cylindrical shells of steel plate, cast steel, or cast iron shall be determined by formulas given in § 52.05-10 and the maximum allowable pressure of heads shall be determined by formulas given in § 52.20-10 of this subchapter.

(b) The maximum allowable pressure for flat surfaces, such as ends, doors, or covers, shall be computed by the following formula:

$$P = \frac{CT^2}{D^2} \quad (1)$$

where:

P = maximum allowable pressure, in pounds per square inch.

T = thickness of casting, in inches.

D = diameter of bolt circle of cover, in inches, for circular surfaces; or, maximum diagonal length to the bolt line for square or rectangular surfaces.

C = 20,000.

§ 54.01-25 *Evaporator safety valves.* (a) An approved safety valve set to relieve at a pressure not exceeding that for which the shell is designed shall be fitted to all evaporators except the following:

(1) Evaporators of the coil or tube type designed to operate with a steam inlet pressure not exceeding 15 pounds per square inch gauge.

(2) Evaporators of the atmospheric type designed for vapor discharge direct to a stiller with no shut-off valve in the discharge line. The stiller connected to atmospheric evaporators shall be fitted with a vent to obviate a build-up in pressure. In no case shall the vent be less than 1½ inches in diameter.

(b) Safety valves for use on unfired pressure vessels in which pressure is generated shall comply with the requirements specified in Part 52 of this sub-

chapter except the valves are not required to be fitted with gags or clamps.

(c) The relieving capacity of safety valves for evaporators not vented to atmosphere in which steam is generated shall be not less than that determined by the following:

(1) The evaporator shell safety valve shall have a rated relieving capacity at a pressure of 3 percent in excess of that at which the valve is set to blow at least equal to the capacity of the orifice fitted in the steam supply to the evaporator.

(2) Where the set pressure of the evaporator shell safety valve is 58 percent or less than the setting of the safety valve on the steam supply, the orifice capacity shall be determined as follows:

$$W = 51.45AP \quad (1)$$

(3) Where the set pressure of the evaporator shell safety valve exceeds 58 percent of the setting of the safety valve on the steam supply, the orifice capacity shall be determined as follows:

$$W = 105.3A \sqrt{P_1(P - P_1)} \quad (2)$$

where:

W = orifice capacity, in pounds per hour.

A = cross-sectional area of rounded entrance orifice, in square inches.¹

P = set pressure of steam supply safety valve, in pounds per square inch, absolute.

P_1 = set pressure of evaporator shell safety valve, in pounds per square inch, absolute.

(d) In no case shall the inlet diameter of a safety valve be less than 1½ inches nominal pipe size.

(e) On new installations and where the orifice size of an existing evaporator is increased, an accumulation test shall be made by closing all steam outlet connections except the safety valves for a period of five minutes. When conducting the accumulation test, the water shall be at the normal operating level and the steam pressure shall be at the normal operating pressure, and while under this test the pressure shall not rise more than 6 percent above the safety valve setting.

§ 54.01-27 *Water level indicator, pressure gauge, and blow-down valve.* In addition to the safety valve required by § 54.01-25, an evaporator in which steam is generated shall be fitted with an efficient water level indicator, a pressure gauge, and a blow-down valve.

§ 54.01-30 *Relief valves.* (a) Unfired pressure vessels, such as tanks containing liquids, gases, or vapors, and in which steam is not generated, shall be protected by a relief valve set to relieve at a pressure not exceeding that for which the vessel is designed and of sufficient relieving capacity to prevent a pressure increase exceeding 10 percent above the maximum allowable pressure. In no case shall the diameter of the relief valve be less than ½ inch.

(b) A heat exchanger with steam in the shell and liquid in the tubes at a pressure exceeding that in the shell shall

have a relief valve fitted with capacity equivalent to that of two tubes in order to protect the shell against excess pressure in the event of the tubes splitting. The discharge of the tubes may be calculated by using the pressure difference between that in the shell and tubes to determine the required capacity of the relief valve.

(c) A heat exchanger, with liquid in the shell and the heating medium in the coils, shall be fitted with a relief valve of sufficient relieving capacity to prevent a pressure increase exceeding 10 percent above the maximum allowable pressure. In no case shall the diameter of the relief valve be less than ½ inch.

Note: For certain pressure vessels containing liquids or vapors whose temperature does not exceed 212° F., the Commandant may authorize the substitution of a bursting or rupture disk where the installation of a relief valve is impracticable. This will not apply to vessels containing lethal or noxious substances.

(d) All relief valves for use on unfired pressure vessels or on piping systems where approved safety valves are not required shall in general comply with the requirements for safety valve construction in Part 52 of this subchapter and shall be designed to suitably meet the protection and service requirements for which they are intended, except that relief valves are not required to have huddling chambers for service other than steam. Cast iron may be employed in the construction of relief valves for pressures not exceeding 125 pounds per square inch and temperatures not exceeding 450° F.

(e) The capacities of relief valves shall be rated at pressures of 3 percent for vapors, 5 percent for gases, and at 10 or 25 percent for liquids above the pressure at which the valve is set.

(f) Relief valves intended for use in liquefied inflammable gas service shall conform to the requirements in Part 38, Subchapter D (Tank Vessel Regulations), of this chapter.

§ 54.01-35 *Inspection.* (a) An unfired pressure vessel is subject to shop inspection when such a vessel may contain any of the following:

(1) Steam, gas, or vapors at pressures exceeding 15 pounds per square inch or temperatures exceeding 300° F. The shell, tubes, or coils of a heat exchanger shall be considered a pressure vessel if such parts may be subjected to steam, gas, or vapor pressures exceeding 15 pounds per square inch or temperatures exceeding 300° F.

(2) Fuel oil at pressures exceeding 100 pounds per square inch or temperatures exceeding 150° F.

(3) Lubricating oil at pressures exceeding 100 pounds per square inch or temperatures exceeding 200° F.

(4) Liquids, except fuel oil and lubricating oil, at pressures exceeding 100 pounds per square inch or temperatures exceeding 200° F.

(5) Liquids in compression tanks with air cushions of pressures exceeding 100 pounds per square inch.

(6) Stored or stowed dangerous articles, substances, or combustible liquids which are required by law or regulation

¹The orifice shall be installed near the steam inlet of the coils or tubes and where no orifice is employed the area used in the formula shall be that of the inlet connection or manifold.

to be carried in containers fabricated as a pressure vessel, irrespective of pressures, temperatures, or capacities; except such stored or stowed dangerous articles, substances, or combustible liquids which are permitted by subchapter N of this chapter (Explosives or Other Dangerous Articles or Substances) to be carried in containers constructed in accordance with the requirements of the Interstate Commerce Commission.

(b) Shop inspection is not required for single unfired pressure vessels having an internal volume not exceeding 5 cubic feet capacity and designed for pressures not exceeding 100 pounds per square inch; however, requirements for materials, construction and welding shall be met, and other markings required to be stamped on unfired pressure vessels by § 54.01-45 shall be stamped thereon by the manufacturer.

(c) Pressure vessels which are fitted with manholes or other inspection openings so they can be satisfactorily examined internally, shall be opened biennially at the regular annual inspection and thoroughly examined internally and externally.

§ 54.01-40 *Hydrostatic tests*—(a) *Test for new pressure vessels*. Upon completion of a new pressure vessel, one of the following applicable hydrostatic tests shall be made in the presence of an inspector:

(1) Riveted construction: 1½ times the maximum allowable pressure.

(2) Brazed construction: 2 times the maximum allowable pressure. (See § 56.05-10 of this subchapter.)

(3) Welded construction: 2 times the maximum allowable pressure. (See § 56.05-10 of this subchapter.)

(4) Cast construction: 2 times the maximum allowable pressure.

(b) *Tests at annual inspections*. Pressure vessels which have neither manholes nor inspection openings, and cannot be satisfactorily examined, shall be tested biennially at the regular annual inspection, to a hydrostatic test of 1¼ times the maximum allowable pressure. Pressure vessels containing refrigerants shall be hydrostatically tested to 1¼ times the maximum allowable pressure at 4-year intervals.

§ 54.01-45 *Markings*. (a) After an inspector has examined a new pressure vessel subject to inspection and has determined that the vessel has been constructed in accordance with the applicable parts of this subchapter, and the vessel has satisfactorily withstood the required tests, the following data shall be stamped thereon:

(Name and address of fabricator)	
(Design pressure)	(Shop test pressure)
(Inspector's No., initials, and C. G. symbol)	(Mr. serial No.)
(Month and year)	(Riveted, brz., welded (Class))

§ 54.01-50 *Foreign-built pressure vessels*. Where unfired pressure vessels or parts of such pressure vessels are manufactured in foreign countries for installation on American vessels, they shall be subject to the same inspection and tests

as American-built pressure vessels. Test specimens of the material marked in such manner as may be prescribed by the Commandant to insure positive identification of the test specimen, with the shell or plate from which it was detached, shall be submitted by the manufacturer, and such material shall comply with all the requirements of Part 51 of this subchapter.

§ 54.01-55 *Bolting*. See § 55.07-20 of this subchapter for bolting requirements.

PART 55—PIPING SYSTEMS

SUBPART 55.01—GENERAL

Sec.
55.01-1 Scope.
55.01-5 Definitions.
55.01-10 Drawings.
55.01-15 Affidavit.

SUBPART 55.04—PIPING CLASSIFICATION

55.04-1 Class I piping.
55.04-5 Class II piping.

SUBPART 55.07—DETAIL REQUIREMENTS

55.07-1 Material.
55.07-5 Calculations.
55.07-10 Valves, flanges, and fittings.
55.07-15 Joints and flange connections.
55.07-20 Bolting.
55.07-25 Installation.
55.07-30 Hydrostatic tests.

SUBPART 55.10—PUMPING ARRANGEMENTS AND PIPING SYSTEMS

55.10-1 Bilge pumps.
55.10-5 Bilge and ballast piping.
55.10-10 Oil transfer and filling systems.
55.10-15 Vent, overflow, and sounding pipes.
55.10-20 Fuel-oil service piping.
55.10-25 Independent fuel piping (Emergency units).
55.10-30 Independent gasoline tanks.
55.10-35 Independent heavy oil tanks.

AUTHORITY: §§ 55.01-1 to 55.10-35, inclusive, issued under R. S. 4405, 4417a, 4418, 4426, 4427, 4429, 4430, 4431, 4432, 4433, 4434, 4453, and 4491, as amended, sec. 14, 29 Stat. 690, 41 Stat. 305, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 363, 366, 367, 375, 391a, 392, 404, 405, 407, 408, 409, 410, 411, 412, 435, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.

SUBPART 55.01—GENERAL

§ 55.01-1 *Scope*. (a) All vessels shall be provided with the necessary piping systems, and pumping arrangements for safe operation in the service for which they are intended.

(b) Piping, within the meaning of this part, is divided into two classes: class I piping and class II piping.

§ 55.01-5 *Definitions*—(a) *Piping*. Piping, within the meaning of the regulations in this subchapter, refers to fabricated pipe or tubes with flanges and fittings attached, for the conveyance of gases or liquids, regardless of whether the diameter is measured on the inside or the outside.

(b) *Nominal diameter*. Nominal diameter, as used in this part except in § 55.07-5 (a), means the commercial diameter of the piping.

§ 55.01-10 *Drawings*. Drawings showing the piping systems shall be submitted to the Officer in Charge, Marine Inspection, in the district where they are being installed. The maximum

pressures of the various systems shall be clearly indicated on the drawings, also the sizes, thickness, and material of the pipe and the type, size, and material of valves and fittings, indicating the maximum pressures for which they have been designed.

§ 55.01-15 *Affidavit*. Each manufacturer of pipe, valves, fittings, and flanges shall file with the Commandant an affidavit, duly executed on form CG 935A, certifying that the product furnished by them for use on vessels subject to inspection by the Coast Guard conforms to all requirements of the regulations in this subchapter.

SUBPART 55.04—PIPING CLASSIFICATION

§ 55.04-1 *Class I piping*. Class I piping shall include all piping as follows:

(a) Operating at pressures exceeding 150 pounds per square inch, gauge.

(b) Operating at temperatures of vapors, gases, and liquids exceeding the following:

- (1) Gases or vapors—370° F.
- (2) Oil—150° F.
- (3) Water—200° F.

(c) Conveying lethal gases or lethal liquids regardless of pressure or temperature.

§ 55.04-5 *Class II piping*. Class II piping shall include all piping for pressures and temperatures not requiring class I piping.

SUBPART 55.07—DETAIL REQUIREMENTS

§ 55.07-1 *Material*. (a) Materials such as pipe, traps, fittings, flanges, valves, etc., except safety valves, are not required to be specifically approved by the Commandant, but shall comply with the applicable requirements for materials, construction, markings, and testing. Detail drawings listing material specifications for pressure-containing appurtenances when of welded construction, shall be submitted to the Officer in Charge, Marine Inspection, before construction is started, in order to determine that the design meets the minimum requirements of this subchapter.

(b) Seamless drawn steel pipe may be used for all purposes and is required for services defined in §§ 52.60-20 and 55.07-5 (b).

(c) Lap-welded steel or iron pipe without diameter limitation may be used where the pressure does not exceed 350 pounds per square inch or the temperature does not exceed 450° F. Furnace butt-welded iron or steel pipe without diameter limitation shall be used only for class II piping. Electric resistance-welded steel pipe may be used where the pressure does not exceed 350 pounds per square inch and the temperature does not exceed 650° F.

(d) Where steel or wrought-iron pipe is used for salt water service, it is recommended that it be galvanized or otherwise protected against corrosive action.

(e) Seamless drawn copper pipe may be used for all purposes where the temperature does not exceed 406° F. but shall not be permitted in any system where it comes in contact with fuel oil, either internally or externally, except that short flexible copper connections of approved construction may be used for oil burners.

Where copper pipe is used it shall be properly annealed before installation.

(f) Copper pipe fabricated with brazed longitudinal joints is permitted for water and saturated steam service for pressures not to exceed 75 pounds per square inch.

(g) Seamless drawn brass pipe may be used where the temperature does not exceed 406° F.

(h) Lead pipe may be used for salt-water supply piping to plumbing fixtures and plumbing drains, also for bilge piping outside of the machinery spaces, but in all cases such pipe shall be properly protected against mechanical injury.

(i) If it is desired to use special alloys and other materials not mentioned in preceding paragraphs, a request to use such material shall be submitted to the Commandant for special consideration.

(j) Forged steel or cast steel, conforming to the requirements of subparts 51.46 and 51.58, may be used in the construction of valves and fittings for any system and for all pressures and temperatures covered by the regulations in this subchapter.

(k) Bronze castings conforming to the requirements of subpart 51.76, grade B, may be used in the construction of valves and fittings for temperatures not exceeding 450° F.

(l) Malleable iron conforming to the requirements of subpart 51.61, for grade A material, may be used in the construction of valves and fittings for pressures not to exceed 250 pounds per square inch and temperatures not to exceed 450° F. Grade B malleable iron may be used for pressures not to exceed 125 pounds per square inch, temperatures not to exceed 450° F, and diameters not to exceed 4 inches. Cast iron conforming to the requirements of subpart 51.64 may be used in the construction of valves and fittings for pressures not to exceed 125 pounds per square inch and temperatures not to exceed 450° F. All these materials shall meet the requirements for the individual piping systems provided for in this part.

(m) Disks, or disk faces, seats, stems and other wearing parts of valves shall be made of material which is noncorrosive under service conditions and which possesses heat-resisting qualities suitable for the temperature to which they are exposed.

(n) Carbon-steel bolting material conforming to the requirements of subpart 51.52 may be employed for temperatures not exceeding 450° F. For temperatures exceeding 450° F. alloy-steel bolting material as specified in subparts 51.49 and 51.55 shall be employed. Pipe fittings for the various services permitted for class II piping fabricated of forged or cast steel, bronze, malleable, or cast iron, or such other equivalent material as may be approved by the Commandant, shall in all cases conform to the requirements of Part 51 of this subchapter.

§ 55.07-5. *Calculations.* (a) (1) The maximum allowable pressure and minimum thickness of pipe shall be computed by one of the following formulas:

$$P = \frac{2S(T-C)}{D} \quad (1)$$

$$T = \frac{PD}{2S} + C \quad (2)$$

where:

P = maximum allowable pressure, in pounds per square inch, except as provided in paragraph (c), for feed and blow-off piping.

T = thickness of pipe, in inches.

D = actual external diameter of pipe, in inches.

S = allowable fiber stress, in pounds per square inch of cross-sectional area. (See table 55.07-5 (a).)

C = Allowance for threading, mechanical strength and/or corrosion, in inches.

$C = 0.065$ for plain end steel or wrought-iron pipe or tubing for sizes above 1 inch.

$C = 0.05$ for plain end steel or wrought-iron pipe or tubing for sizes 1 inch and below.

$C = 0.05$ for threaded pipe $\frac{3}{8}$ inch and smaller.

C = Depth of thread h for threaded pipe $\frac{1}{2}$ inch and larger.

C = Depth of groove for grooved pipe.

$C = 0.00$ for plain end, nonferrous pipe or tubing.

NOTE 1: Plain end pipe or tubing includes that joined by flared compression couplings, lap (Van Stone) joints, brazing, and by welding, i. e., by any method which does not reduce the wall thickness at the joint.

NOTE 2: The depth of thread h may be determined by the formula $h = \frac{0.8}{n}$; where n =

the number of threads per inch; $h = 0.100$ -inch, 0.0696-inch, and 0.0571-inch for 8, 11½ and 14 threads per inch, respectively.

(2) The value of P in the formula shall not be less than 150 p. s. i. for any condition of service or material.

TABLE 55.07 (a)—ALLOWABLE FIBER STRESSES FOR PIPING IN POUNDS PER SQUARE INCH¹

Specification subpart	Grade	Minimum tensile strength p. s. i.	For temperature not exceeding °F. ²						
			650	700	750	800	850	900	950
Seamless									
51.34	A	48,000	7,200	6,800	6,400	5,400	4,300		
51.34	B	60,000	9,000	8,500	7,800	6,800	5,500		
51.34 C-Moly	P1	55,000	8,200	8,200	8,200	8,000	7,800	7,500	
51.34 Cr-Moly		55,000	8,200	8,200	8,200	8,000	7,800	7,500	6,000
51.37	A	48,000	7,200	6,800	6,400				
51.37	B	60,000	9,000	8,500	7,800				

¹ Seamless medium-carbon steel pipe may be used for the construction of drum shells, and shall be computed in accordance with the formulas provided in sections 52.05-10 and 52.05-25 of this subchapter for cylindrical shells.

² Intermediate values of S may be obtained by interpolation.

$S = 85$ percent of above values for electric-resistance-welded steel pipe, subparts 51.37 and 51.40 (temperature not to exceed 650° F.).

$S = 4,800$ for furnace-welded steel pipe, subparts 51.34 and 51.37 (temperature not to exceed 450° F.). Butt welded limited to class II service.

$S = 4,400$ for welded iron pipe, subpart 51.43 (temperature not to exceed 450° F.). Butt welded limited to class II service.

$S = 3,500$ for seamless copper pipe, subpart 51.73 and seamless brass pipe, subpart 51.70 temperature not to exceed 406° F.).

$S = 2,625$ for brazed copper pipe (temperature not to exceed 406° F.).

(b) Fuel-oil service-discharge piping connecting the pumps to the burners shall be of seamless steel pipe of a thickness not less than that required for what is commercially known as extra-strong pipe.

(c) Feed-water and blow-off piping external to the boiler shall be designed to withstand a pressure of 20 percent in excess of the maximum allowable pressure.

(d) Where a welded pipe is pierced with holes, such holes shall be outside of the weld, and in any pipe the unit stress in the ligaments shall not exceed one-fifth of the specified range of tensile strength of the material, and in no case shall the pressure exceed that given by the above formula (1).

(e) Pipes intended for bending shall be of a thickness sufficient to compensate for the thinning in the outer walls of the bend. The radius of curvature at the center line of the pipe shall not be less than twice the external diameter of the pipe.

(f) Superheater outlet flanges and superheated and desuperheated steam piping direct from the boiler shall be designed for not less than the maximum pressure and temperature to which they may be exposed in service under normal sustained operating conditions. Occasional increases in pressure and/or temperature are unavoidable and may be permitted without changing the normal design, provided the increase of stress in the piping due to the temporary conditions does not exceed 15 percent during 10 percent of the operating period

or 20 percent during 1 percent of the operating period.

(g) Class II piping of steel or wrought iron shall have a nominal wall thickness equal to commercial standard weight, and for severe service, such as ash-ejector discharge, a thickness not less than commercial extra-strong weight shall be used. Piping of other materials shall have a wall thickness consistent with good engineering practice, and when screwed into flanges or fittings, the thickness shall not be less than for standard weight pipe of the same size.

(h) Where the Officer in Charge, Marine Inspection, is not otherwise satisfied, each length of piping having a diameter exceeding 4 inches shall be drilled, for the purpose of gauging, and fitted with a screw plug to extend beyond the pipe covering. Where bends are used, the test holes shall be drilled in the outer wall of the bend. The drilling of such pipes may be omitted where pipes which are intended for bending comply with paragraph (e).

§ 55.07-10. *Valves, flanges, and fittings.*

(a) Valves exceeding 2 inches nominal pipe size used for class I piping shall have bolted or pressure-seal bonnets and flanged or welding ends, except as noted in § 55.07-15 (g). (For boiler mountings see § 52.70-10 (a).)

(b) Cast-iron valves may have bolted bonnets or union bonnets. If of the latter type, the union bonnet ring shall be made of steel, bronze, or malleable iron. Cast-iron valves with screwed-in or screwed-over bonnets are not permitted for any service.

(c) Screw-down valves for class I piping shall be of the bolted or union bonnet type, or of a type where positive means is provided to prevent the bonnet from being unscrewed from the body when the stem is rotated to lift the disk.

(d) All valves shall be made to close with a right-hand (clockwise) motion of the wheel, facing the end of the stem of the valve.

(e) Valves shall be of the rising-stem type, preferably with outside yoke or specially approved valves designed to show clearly whether they are open or closed.

(f) (1) All steel valves, flanges and fittings shall be legibly marked with the manufacturer's name or registered trade-mark, and the primary service pressure rating for which he guarantees them.

(2) All cast iron valves, flanges, and fittings shall be legibly marked with the manufacturer's name or registered trade-mark, and in addition all such valves and flanged fittings shall be marked with the primary service pressure rating for which he guarantees them.

(3) All malleable iron valves, flanges, and fittings shall be legibly marked with the manufacturer's name or registered trade-mark and the primary service pressure rating for which he guarantees them, except that 150-pound pressure screwed fittings (Federal Specification WW-P-521a) need not carry a service pressure marking.

(4) All bronze valves, flanges, and fittings shall be legibly marked with the manufacturer's name or registered trade-mark and in addition all such valves and flanged fittings shall be marked with the primary service pressure rating for which he guarantees them. Bronze screwed fittings may be identified as to pressure class by the type of reinforcing bands at the inlet and outlet. The 125-pound fittings (Federal Specification WW-P-448) have narrow bands widely separated at the fitting crotches. The 250-pound fittings (Federal Specification WW-P-461) have wide heavy bands which meet at and fill the crotches.

(5) Small finished or polished nonferrous products such as trycocks or petcocks need not be marked.

(g) Seamless or welded fittings fabricated from plate or seamless steel pipe

conforming with the appropriate subpart of Part 51 may be used for class I piping if welded in accordance with the requirements of Part 56 of this subchapter.

(h) Ordinary cocks, where the plug is held in the body of the cock by a single nut, are not permitted for class I piping.

(i) Where cocks are used in class I piping they shall be marked in a straight line with the body to indicate whether same are open or closed.

§ 55.07-15 Joints and flange connections. (a) Flanges designated by this part are companion flanges which may be either bolted together or used singly in connection with flanged valves or fittings.

(b) Flanges for steel or wrought-iron piping for class I service shall be of forged steel, cast steel, or alloy steel which have been approved by the Commandant.

(c) Flanges used in connection with copper pipe shall be made of bronze, forged steel, or cast steel.

(d) Cast-iron flanges are not permitted for class I piping.

(e) Flanges for class I piping shall conform in strength at least to the dimensional standards in the following tables:

TABLE 55.07-15 (e1)—BRONZE FLANGED FITTINGS AND COMPANION FLANGES

Nominal pipe size (inches)	150 pounds						
	Outside diameter of flange (inches)	Flange thickness, minimum ¹ (inches)	Diameter of bolt circle (inches)	Number of bolts	Size of bolts (inches)	Metal thickness of fitting, minimum (inches)	Hub diameter, minimum (inches)
1/2	3 1/2	3/16	2 3/4	4	1/2	3/16	1 3/4
3/4	3 7/8	1/8	2 3/4	4	1/2	1/8	1 3/4
1	4 1/8	3/8	3 1/4	4	1/2	3/8	1 3/4
1 1/4	4 5/8	1/2	3 3/4	4	1/2	1/2	1 3/4
1 1/2	5	5/8	3 3/4	4	1/2	5/8	1 3/4
2	5 1/2	3/4	4 1/4	4	1/2	3/4	1 3/4
2 1/2	6 1/8	7/8	4 1/4	4	1/2	7/8	1 3/4
3	6 3/4	1	4 1/4	4	1/2	1	1 3/4
3 1/2	7 1/8	1 1/8	4 1/4	4	1/2	1 1/8	1 3/4
4	7 3/4	1 1/4	4 1/4	4	1/2	1 1/4	1 3/4
5	8 1/2	1 1/2	4 1/4	4	1/2	1 1/2	1 3/4
6	9 1/4	1 3/4	4 1/4	4	1/2	1 3/4	1 3/4
8	10 3/4	1 7/8	4 1/4	4	1/2	1 7/8	1 3/4
10	11 3/4	2	4 1/4	4	1/2	2	1 3/4
12	12 3/4	2 1/4	4 1/4	4	1/2	2 1/4	1 3/4

¹ The "flange thickness, minimum" as shown in the table is the dimension from back of flange to gasket contact face. Blind flanges may be recessed 1/16 inch with a diameter equal to the inside diameter of the flange fitting.

TABLE 55.07-15 (e2)—BRONZE FLANGED FITTINGS AND COMPANION FLANGES

Nominal pipe size (inches)	250 and 300 pounds						
	Outside diameter of flange (inches)	Flange thickness, minimum ¹ (inches)	Diameter of bolt circle (inches)	Number of bolts	Size of bolts (inches)	Metal thickness of fitting, minimum (inches)	Hub diameter, minimum (inches)
1/2	3 3/4	1/2	2 3/4	4	1/2	1/2	1 3/4
3/4	4 1/8	5/8	3 1/4	4	1/2	5/8	1 3/4
1	4 5/8	3/4	3 3/4	4	1/2	3/4	1 3/4
1 1/4	5 1/8	7/8	3 3/4	4	1/2	7/8	1 3/4
1 1/2	5 3/8	1	3 3/4	4	1/2	1	1 3/4
2	6 1/8	1 1/8	4 1/4	4	1/2	1 1/8	1 3/4
2 1/2	6 3/4	1 1/4	4 1/4	4	1/2	1 1/4	1 3/4
3	7 1/8	1 1/2	4 1/4	4	1/2	1 1/2	1 3/4
3 1/2	7 3/4	1 3/4	4 1/4	4	1/2	1 3/4	1 3/4
4	8 1/4	1 7/8	4 1/4	4	1/2	1 7/8	1 3/4
5	9 1/4	2	4 1/4	4	1/2	2	1 3/4
6	10 1/4	2 1/4	4 1/4	4	1/2	2 1/4	1 3/4
8	11 3/4	2 3/4	4 1/4	4	1/2	2 3/4	1 3/4

¹ The "flange thickness, minimum" as shown in the table is the dimension from back of flange to gasket contact face. Blind flanges may be recessed 1/16 inch with a diameter equal to the inside diameter of the flange fitting.

TABLE 55.07-15 (e3)—STEEL FLANGED FITTINGS AND COMPANION FLANGES

[For maximum steam service pressure at a temperature of 500° F.]

Nominal pipe size (inches)	150 pounds						
	Outside diameter of flange (inches)	Thickness of flange, minimum ¹ (inches)	Flange thickness, minimum ² (inches)	Diameter of bolt circle (inches)	Number of bolts	Size of bolts (inches)	Hub diameter at base (inches)
1/2	3 1/2	3/16	1/8	2 3/4	4	1/2	1 3/4
3/4	3 7/8	1/8	1/8	2 3/4	4	1/2	1 3/4
1	4 1/8	3/8	1/4	3 1/4	4	1/2	1 3/4
1 1/4	4 5/8	1/2	1/4	3 3/4	4	1/2	1 3/4
1 1/2	5	5/8	1/4	3 3/4	4	1/2	1 3/4
2	5 1/2	3/4	1/4	4 1/4	4	1/2	1 3/4
2 1/2	6 1/8	7/8	1/4	4 1/4	4	1/2	1 3/4
3	6 3/4	1	1/4	4 1/4	4	1/2	1 3/4
3 1/2	7 1/8	1 1/8	1/4	4 1/4	4	1/2	1 3/4
4	7 3/4	1 1/4	1/4	4 1/4	4	1/2	1 3/4
5	8 1/4	1 1/2	1/4	4 1/4	4	1/2	1 3/4
6	9 1/4	1 3/4	1/4	4 1/4	4	1/2	1 3/4
8	10 3/4	1 7/8	1/4	4 1/4	4	1/2	1 3/4
10	11 3/4	2	1/4	4 1/4	4	1/2	1 3/4
12	12 3/4	2 1/4	1/4	4 1/4	4	1/2	1 3/4
14 O. D.	14 1/2	2 1/2	1/4	4 1/4	4	1/2	1 3/4
16 O. D.	16 1/2	2 3/4	1/4	4 1/4	4	1/2	1 3/4
18 O. D.	18 1/2	3	1/4	4 1/4	4	1/2	1 3/4
20 O. D.	20 1/2	3 1/4	1/4	4 1/4	4	1/2	1 3/4
24 O. D.	24 1/2	4	1/4	4 1/4	4	1/2	1 3/4

¹ The raised face of 1/16 inch is included in "thickness of flange, minimum."

² A raised face of 1/16 inch is provided on the flange of each opening of these fittings and is included in "thickness of flange, minimum."

RULES AND REGULATIONS

TABLE 55.07-15 (e4)—STEEL FLANGED FITTINGS AND COMPANION FLANGES

[For maximum steam service pressure at a temperature of 750° F.]

Nominal pipe size (inches)	300 pounds					
	Outside diameter of flange (inches)	Thickness of flange, minimum (inches)	Diameter of bolt circle (inches)	Number of bolts	Size of bolts (inches)	Hub diameter at base (inches)
1/2	3 3/4	9/16	2 1/2	4	1/2	1 1/2
3/4	4 1/2	1 1/16	3 1/4	4	5/8	1 7/8
1	4 7/8	1 1/8	3 3/4	4	5/8	2 1/8
1 1/4	5 1/4	1 1/4	3 7/8	4	5/8	2 1/4
1 1/2	6 1/4	1 3/8	4 1/2	4	3/4	2 3/4
2	6 1/2	1 3/8	5	8	3/4	3 1/4
2 1/2	7 1/2	1 3/8	5 7/8	8	3/4	3 1/2
3	8 1/4	1 3/8	6 3/8	8	3/4	3 3/4
3 1/2	9	1 3/8	7 1/4	8	3/4	3 5/4
4	10 1/4	1 3/8	7 7/8	8	3/4	3 5/4
5	11 1/4	1 3/8	9 1/4	8	3/4	3 7/4
6	12 1/4	1 3/8	10 3/8	12	3/4	3 7/4
8	15 1/4	1 3/8	13 1/2	12	7/8	10 1/4
10	17 1/4	1 3/8	15 1/4	16	1	12 3/8
12	20 1/4	2	17 3/4	16	1 1/4	14 3/4
14 O. D.	23 1/4	2 1/4	20 1/4	20	1 1/2	16 3/4
16 O. D.	25 1/4	2 1/4	22 1/4	20	1 1/2	18 1/4
18 O. D.	28 1/4	2 1/4	24 1/4	24	1 3/4	21 1/4
20 O. D.	30 1/4	2 1/4	27 1/4	24	1 3/4	23 1/4
24 O. D.	36	2 3/4	32	24	1 3/4	27 3/4

1 The raised face of 1/4 inch is included in "thickness of flange, minimum."

TABLE 55.07-15 (e5)—STEEL FLANGED FITTINGS AND COMPANION FLANGES

[For maximum steam service pressure at a temperature of 750° F.]

Nominal pipe size (inches)	400 pounds					
	Outside diameter of flange (inches)	Thickness of flange, minimum (inches)	Diameter of bolt circle (inches)	Number of bolts	Size of bolts (inches)	Hub diameter at base (inches)
1/2	3 3/4	9/16	2 1/2	4	1/2	1 1/2
3/4	4 1/2	1 1/16	3 1/4	4	5/8	1 7/8
1	4 7/8	1 1/8	3 3/4	4	5/8	2 1/8
1 1/4	5 1/4	1 1/4	3 7/8	4	5/8	2 1/4
1 1/2	6 1/4	1 3/8	4 1/2	4	3/4	2 3/4
2	6 1/2	1 3/8	5	8	3/4	3 1/4
2 1/2	7 1/2	1 3/8	5 7/8	8	3/4	3 1/2
3	8 1/4	1 3/8	6 3/8	8	3/4	3 3/4
3 1/2	9	1 3/8	7 1/4	8	3/4	3 5/4
4	10 1/4	1 3/8	7 7/8	8	3/4	3 5/4
5	11 1/4	1 3/8	9 1/4	8	3/4	3 7/4
6	12 1/4	1 3/8	10 3/8	12	3/4	3 7/4
8	15 1/4	1 3/8	13 1/2	12	7/8	10 1/4
10	17 1/4	1 3/8	15 1/4	16	1	12 3/8
12	20 1/4	2	17 3/4	16	1 1/4	14 3/4
14 O. D.	23 1/4	2 1/4	20 1/4	20	1 1/2	16 3/4
16 O. D.	25 1/4	2 1/4	22 1/4	20	1 1/2	18 1/4
18 O. D.	28 1/4	2 1/4	24 1/4	24	1 3/4	21 1/4
20 O. D.	30 1/4	2 1/4	27 1/4	24	1 3/4	23 1/4
24 O. D.	36	3	32	24	1 3/4	27 3/4

1 A raised face of 1/4 inch is not included in the minimum thickness of flanges.

TABLE 55.07-15 (e6)—STEEL FLANGED FITTINGS AND COMPANION FLANGES

[For maximum steam service pressure at a temperature of 750° F.]

Nominal pipe size (inches)	600 pounds					
	Outside diameter of flange (inches)	Thickness of flange, minimum (inches)	Diameter of bolt circle (inches)	Number of bolts	Size of bolts (inches)	Hub diameter at base (inches)
1/2	3 3/4	9/16	2 1/2	4	1/2	1 1/2
3/4	4 1/2	1 1/16	3 1/4	4	5/8	1 7/8
1	4 7/8	1 1/8	3 3/4	4	5/8	2 1/8
1 1/4	5 1/4	1 1/4	3 7/8	4	5/8	2 1/4
1 1/2	6 1/4	1 3/8	4 1/2	4	3/4	2 3/4
2	6 1/2	1 3/8	5	8	3/4	3 1/4
2 1/2	7 1/2	1 3/8	5 7/8	8	3/4	3 1/2
3	8 1/4	1 3/8	6 3/8	8	3/4	3 3/4
3 1/2	9	1 3/8	7 1/4	8	3/4	3 5/4
4	10 1/4	1 3/8	7 7/8	8	3/4	3 5/4
5	11 1/4	1 3/8	9 1/4	8	3/4	3 7/4
6	12 1/4	1 3/8	10 3/8	12	3/4	3 7/4
8	15 1/4	1 3/8	13 1/2	12	7/8	10 1/4
10	17 1/4	1 3/8	15 1/4	16	1	12 3/8
12	20 1/4	2	17 3/4	16	1 1/4	14 3/4
14 O. D.	23 1/4	2 1/4	20 1/4	20	1 1/2	16 3/4
16 O. D.	25 1/4	2 1/4	22 1/4	20	1 1/2	18 1/4
18 O. D.	28 1/4	2 1/4	24 1/4	24	1 3/4	21 1/4
20 O. D.	30 1/4	2 1/4	27 1/4	24	1 3/4	23 1/4
24 O. D.	37	4	33	24	1 3/4	28 3/4

1 A raised face of 1/4 inch is not included in the minimum thickness of flanges.

TABLE 55.07-15 (e7)—STEEL FLANGED FITTINGS AND COMPANION FLANGES

[For maximum steam service pressure at a temperature of 750° F.]

Nominal pipe size (inches)	900 pounds					
	Outside diameter of flange (inches)	Thickness of flange, minimum (inches)	Diameter of bolt circle (inches)	Number of bolts	Size of bolts (inches)	Hub diameter at base (inches)
1/2	4 3/4	1 1/8	3 1/4	4	3/4	1 1/2
3/4	5 1/2	1 1/4	3 3/4	4	3/4	1 3/4
1	5 7/8	1 1/2	3 7/8	4	3/4	2 1/8
1 1/4	6 1/4	1 3/8	4 1/2	4	3/4	2 1/4
1 1/2	7	1 3/8	4 7/8	4	3/4	2 3/4
2	8 1/2	1 3/8	5 1/2	8	3/4	3 1/4
2 1/2	9 1/2	1 3/8	5 7/8	8	3/4	3 1/2
3	10 1/2	1 3/8	6 1/2	8	3/4	3 3/4
3 1/2	11 1/2	1 3/8	6 7/8	8	3/4	3 5/4
4	12 1/2	1 3/8	7 1/4	8	3/4	3 5/4
5	13 1/2	1 3/8	8 1/4	8	3/4	3 7/4
6	14 1/2	1 3/8	9 1/4	8	3/4	3 7/4
8	18 1/2	1 3/8	12 1/2	12	7/8	10 1/4
10	21 1/2	2	15 1/2	12	1	12 3/8
12	24 1/2	2 1/4	18 1/2	16	1 1/4	14 3/4
14 O. D.	25 1/4	2 1/4	22	20	1 1/2	16 3/4
16 O. D.	27 1/4	2 1/4	24 1/4	20	1 1/2	18 1/4
18 O. D.	31	2 1/4	27	24	1 3/4	21 1/4
20 O. D.	33 1/4	2 1/4	29 1/4	24	1 3/4	23 1/4
24 O. D.	41	3 1/2	35 1/2	24	1 3/4	29 3/4

1 A raised face of 1/4 inch is not included in the minimum thickness of flanges.

TABLE 55.07-15 (e8)—STEEL FLANGED FITTINGS AND COMPANION FLANGES

[For maximum steam service pressure at a temperature of 750° F.]

Nominal pipe size (inches)	1,500 pounds					
	Outside diameter of flange (inches)	Thickness of flange, minimum (inches)	Diameter of bolt circle (inches)	Number of bolts	Size of bolts (inches)	Hub diameter at base (inches)
1/2	4 3/4	1 1/8	3 1/4	4	3/4	1 1/2
3/4	5 1/2	1 1/4	3 3/4	4	3/4	1 3/4
1	5 7/8	1 1/2	3 7/8	4	3/4	2 1/8
1 1/4	6 1/4	1 3/8	4 1/2	4	3/4	2 1/4
1 1/2	7	1 3/8	4 7/8	4	3/4	2 3/4
2	8 1/2	1 3/8	5 1/2	8	3/4	3 1/4
2 1/2	9 1/2	1 3/8	5 7/8	8	3/4	3 1/2
3	10 1/2	1 3/8	6 1/2	8	3/4	3 3/4
3 1/2	11 1/2	1 3/8	6 7/8	8	3/4	3 5/4
4	12 1/2	1 3/8	7 1/4	8	3/4	3 5/4
5	13 1/2	1 3/8	8 1/4	8	3/4	3 7/4
6	14 1/2	1 3/8	9 1/4	8	3/4	3 7/4
8	18 1/2	1 3/8	12 1/2	12	7/8	10 1/4
10	21 1/2	2	15 1/2	12	1	12 3/8
12	24 1/2	2 1/4	18 1/2	16	1 1/4	14 3/4
14 O. D.	25 1/4	2 1/4	22	20	1 1/2	16 3/4
16 O. D.	27 1/4	2 1/4	24 1/4	20	1 1/2	18 1/4
18 O. D.	31	2 1/4	27	24	1 3/4	21 1/4
20 O. D.	33 1/4	2 1/4	29 1/4	24	1 3/4	23 1/4
24 O. D.	46	3 1/2	39	24	1 3/4	30

1 A raised face of 1/4 inch is not included in the minimum thickness of flanges.

TABLE 55.07-15 (e9)—STEEL FLANGED FITTINGS AND COMPANION FLANGES

[For maximum steam service pressure at a temperature of 750° F.]

Nominal pipe size (inches)	2,500 pounds					
	Outside diameter of flange (inches)	Thickness of flange, minimum (inches)	Diameter of bolt circle (inches)	Number of bolts	Size of bolts (inches)	Hub diameter at base (inches)
1/2	5 1/4	1 3/8	3 1/4	4	3/4	1 1/2
3/4	5 1/2	1 3/8	3 3/4	4	3/4	1 3/4
1	6 1/4	1 3/8	3 7/8	4	3/4	2 1/8
1 1/4	7 1/4	1 3/8	4 1/2	4	3/4	2 1/4
1 1/2	8	1 3/8	4 7/8	4	3/4	2 3/4
2	9 1/4	1 3/8	5 1/2	8	3/4	3 1/4
2 1/2	10 1/2	1 3/8	5 7/8	8	3/4	3 1/2
3	11 1/2	1 3/8	6 1/2	8	3/4	3 3/4
3 1/2	12 1/2	1 3/8	6 7/8	8	3/4	3 5/4
4	13 1/2	1 3/8	7 1/4	8	3/4	3 5/4
5	14 1/2	1 3/8	8 1/4	8	3/4	3 7/4
6	15 1/2	1 3/8	9 1/4	8	3/4	3 7/4
8	19 1/2	1 3/8	12 1/2	12	7/8	10 1/4
10	23 1/2	2	15 1/2	12	1	12 3/8
12	26 1/2	2 1/4	18 1/2	16	1 1/4	14 3/4
14 O. D.	27 1/4	2 1/4	22	20	1 1/2	16 3/4
16 O. D.	29 1/4	2 1/4	24 1/4	20	1 1/2	18 1/4
18 O. D.	33 1/4	2 1/4	27	24	1 3/4	21 1/4
20 O. D.	37 1/4	2 1/4	29 1/4	24	1 3/4	23 1/4
24 O. D.	51	3 1/2	39	24	1 3/4	30

1 The raised face of 1/4 inch is not included in "thickness of flange minimum."

TABLE 55.07-15 (e10)—SERVICE PRESSURE RATINGS FOR STEEL PIPE FLANGES AND FLANGED FITTINGS¹

Primary service pressure ratings	Carbon steel flanges and flanged fittings at temperatures 850° F. and below with standard facings (other than ring joints)							Carbon steel flanges and flanged fittings at temperatures 850° F. and below with ring-joint facings						
	150	300	400	600	900	1,500	2,500	150	300	400	600	900	1,500	2,500
Maximum hydrostatic shell test pressures ²	350	750	1,000	1,500	2,000	3,500	6,000	350	750	1,000	1,500	2,000	3,500	6,000
Service temperatures (° F.)	Maximum, nonshock, service pressure ratings at temperatures from 100° to 850° F.							Maximum, nonshock, service pressure ratings at temperatures from 100° to 850° F.						
100.....	230	500	670	1,000	1,500	2,500	4,170	275	600	800	1,200	1,800	3,000	5,000
150.....	220	480	640	960	1,440	2,400	4,000	255	575	765	1,150	1,725	2,875	4,790
200.....	210	465	620	930	1,395	2,325	3,875	240	550	730	1,100	1,650	2,750	4,580
250.....	200	450	600	900	1,350	2,250	3,750	225	525	700	1,050	1,575	2,625	4,375
300.....	190	435	580	870	1,305	2,175	3,625	210	500	670	1,000	1,500	2,500	4,170
350.....	180	420	560	840	1,260	2,100	3,500	195	475	635	950	1,425	2,375	3,960
400.....	170	405	540	810	1,215	2,025	3,375	180	450	600	900	1,350	2,250	3,750
450.....	160	390	520	780	1,170	1,950	3,250	165	425	565	850	1,275	2,125	3,540
500.....	150	375	500	750	1,125	1,875	3,125	150	400	530	800	1,200	2,000	3,330
550.....	140	360	480	720	1,080	1,800	3,000	140	380	505	760	1,140	1,900	3,165
600.....	130	345	460	690	1,035	1,725	2,875	130	360	480	720	1,080	1,800	3,000
650.....	120	330	440	660	990	1,650	2,750	120	340	450	680	1,020	1,700	2,830
700.....	110	315	420	630	945	1,575	2,625	110	320	425	640	960	1,600	2,665
750.....	100	300	400	600	900	1,500	2,500	100	300	400	600	900	1,500	2,500
800.....	85	250	335	500	750	1,250	2,085	85	250	335	500	750	1,250	2,085
850.....	70	200	270	400	600	1,000	1,670	70	200	270	400	600	1,000	1,670

¹ All pressures are in pounds per square inch, gauge.² All tests shall be made with water at a temperature not to exceed 125° F.³ Primary service pressure rating.TABLE 55.07-15 (e11)—SERVICE PRESSURE RATINGS FOR STEEL PIPE FLANGES AND FLANGED FITTINGS¹

Primary service pressure ratings	Alloy steels of suitable heat resistant properties at temperatures 1,000° F. and below with standard facings (other than ring joints) ²						Alloy steels of suitable heat resistant properties at temperatures 1,000° F. and below with ring joints ²					
	300	400	600	900	1,500	2,500	300	400	600	900	1,500	2,500
Maximum hydrostatic shell test pressures ³	900	1,200	1,800	2,400	4,200	7,200	900	1,200	1,800	2,400	4,200	7,200
Service temperatures (° F.)	Maximum, nonshock, service pressure ratings at temperatures from 100° to 1,000° F.						Maximum, nonshock service pressure ratings at temperatures from 100° to 1,000° F.					
100.....	600	800	1,200	1,800	3,000	5,000	720	960	1,440	2,160	3,600	6,000
150.....	590	775	1,180	1,770	2,950	4,905	700	925	1,400	2,100	3,500	5,825
200.....	580	750	1,160	1,740	2,900	4,810	675	900	1,350	2,025	3,375	5,625
250.....	560	725	1,120	1,680	2,800	4,645	650	875	1,300	1,950	3,250	5,425
300.....	540	700	1,080	1,620	2,700	4,480	625	825	1,250	1,875	3,125	5,200
350.....	520	675	1,040	1,560	2,600	4,315	600	800	1,200	1,800	3,000	5,000
400.....	500	650	1,000	1,500	2,500	4,150	575	775	1,150	1,725	2,875	4,800
450.....	480	625	960	1,440	2,400	3,985	550	725	1,100	1,650	2,750	4,575
500.....	460	600	920	1,380	2,300	3,820	525	700	1,050	1,575	2,625	4,375
550.....	440	575	880	1,320	2,200	3,655	500	675	1,000	1,500	2,500	4,175
600.....	420	550	840	1,260	2,100	3,490	475	625	950	1,425	2,375	3,950
650.....	400	525	800	1,200	2,000	3,325	450	600	900	1,350	2,250	3,750
700.....	380	500	760	1,140	1,900	3,160	425	575	850	1,275	2,125	3,550
750.....	360	475	720	1,080	1,800	2,995	400	525	800	1,200	2,000	3,325
800.....	340	450	680	1,020	1,700	2,830	375	500	750	1,125	1,875	3,125
850.....	320	425	640	960	1,600	2,665	350	475	700	1,050	1,750	2,925
900.....	300	400	600	900	1,500	2,500	325	425	650	975	1,625	2,700
950.....	265	350	530	795	1,325	2,205	300	400	600	900	1,500	2,500
1,000.....	190	250	380	570	950	1,580	200	275	400	600	1,000	1,675

¹ All pressures are in pounds per square inch, gauge.² All tests shall be made with water at a temperature not to exceed 125° F.³ Carbon-molybdenum steel flanges and flanged fittings are not permitted for temperatures exceeding 900° F.⁴ Primary service pressure ratings.

(f) Flanges shall be attached to the pipe by any method shown by figures 55.07-15 (f1) to 55.07-15 (f17), inclusive, or by any other means that may be approved by the Commandant.

(g) Forged-steel welding fittings, valves, or flanges, of the socket type, wherein the piping is attached by inserting the pipe into the socket and securing it to the fitting with a fillet weld, may be used where the diameter of the pipe does not exceed 2½ inches nominal pipe size for class I piping and without diameter limitation for class II piping, provided the welding is done by qualified welders.

(h) Fittings, valves, or flanges made of nonferrous metal may be attached to nonferrous pipe by means of soldering the wall of the pipe to the fitting where the pressure does not exceed 100 pounds per square inch and the temperature does not exceed 240° F. When it is desired to use such fittings for higher pressures or temperatures the kind of solder material used for alloying the wall of the pipe to the fittings shall be approved by the Commandant.

(i) Where it is desired to use other methods for attaching flanges to piping, the matter shall be submitted to the Commandant for consideration.

(j) (1) Flanges for class II piping shall be made of forged steel, cast steel, steel plate, wrought iron, bronze, malleable iron, cast iron, or such other equivalent material as may be approved by the Commandant.

(2) For class II piping, steel flanges shall conform to the standards given in tables 55.07-15 (e3) to 55.07-15 (e9), inclusive; bronze flanges shall conform to the standards given in tables 55.07-15 (e1) and 55.07-15 (e2); and cast-iron flanges shall conform to the standards given in tables 55.07-15 (j1) and 55.07-15 (j2).

(3) Flanges for class II piping may be attached by any method specified by figures 55.07-15 (f1) to 55.07-15 (f17), inclusive, or by any other means that may be approved by the Commandant.

TABLE 55.07-15(j1)—CAST-IRON FLANGED FITTINGS AND COMPANION FLANGES, CLASS 125

[125-pound cast-iron flanged fittings. All dimensions given in inches]

Nominal pipe size ^{2,3}	Diameter of flange	Thickness of flange (minimum)	Diameter of bolt circle	No. bolts
1.....	4½	7/16	3½	4
1½.....	4¾	7/16	3½	4
2.....	5	7/16	3¾	4
2½.....	6	7/16	4¾	4
3.....	7	7/16	5½	4
3½.....	7½	7/16	6	4
4.....	8½	7/16	7	8
4½.....	9	7/16	7½	8
5.....	10	7/16	8½	8
6.....	11	1	9½	8
8.....	13½	1½	11¾	8
10.....	16	1¾	14¼	12
12.....	19	1¾	17	12
14 O. D.....	21	1¾	18¾	12
16 O. D.....	23½	1¾	21¼	16
18 O. D.....	25	1¾	22¾	16
20 O. D.....	27½	1¾	25	20
24 O. D.....	32	1¾	29¼	20
30 O. D.....	38¾	2¼	36	28
36 O. D.....	46	2¾	42¾	32

Nominal pipe size ^{2,3}	Size of bolts	Metal thickness (minimum)	Diameter of hub (minimum)	Length of hub and threads (minimum)
1.....	¾	5/16	1½	0.68
1½.....	¾	5/16	2½	0.79
2.....	¾	5/16	2½	0.87
2½.....	¾	5/16	3½	1.00
3.....	¾	5/16	3½	1.14
3½.....	¾	5/16	4¼	1.20
4.....	¾	5/16	4¾	1.25
4½.....	¾	5/16	5½	1.30
5.....	¾	5/16	6½	1.41
6.....	¾	5/16	7½	1.51
8.....	¾	5/16	9½	1.71
10.....	¾	5/16	11½	1.93
12.....	¾	5/16	14½	2.13
14 O. D.....	1	¾	15¾	2.25
16 O. D.....	1	1	17½	2.45
18 O. D.....	1½	1½	19¾	2.65
20 O. D.....	1½	1½	21¾	2.85
24 O. D.....	1½	1½	26	3.25
30 O. D.....	1½	1½	-----	-----
36 O. D.....	1½	1¾	-----	-----

¹ All 125-pound standard flanges have a plain face.² Sizes 14 inches and larger are to be used with O. D. pipe of the same size.³ All blind flanges for size 12 inches (19 inches O. D.) and larger must be dished, with inside radius equal to the port diameter.⁴ This column is the same as column for effective thread (E) in table 1 of the American Pipe Thread Standard, published by the American Engineering Standards Committee, except in sizes 1¼, 1½, and 2 inches.

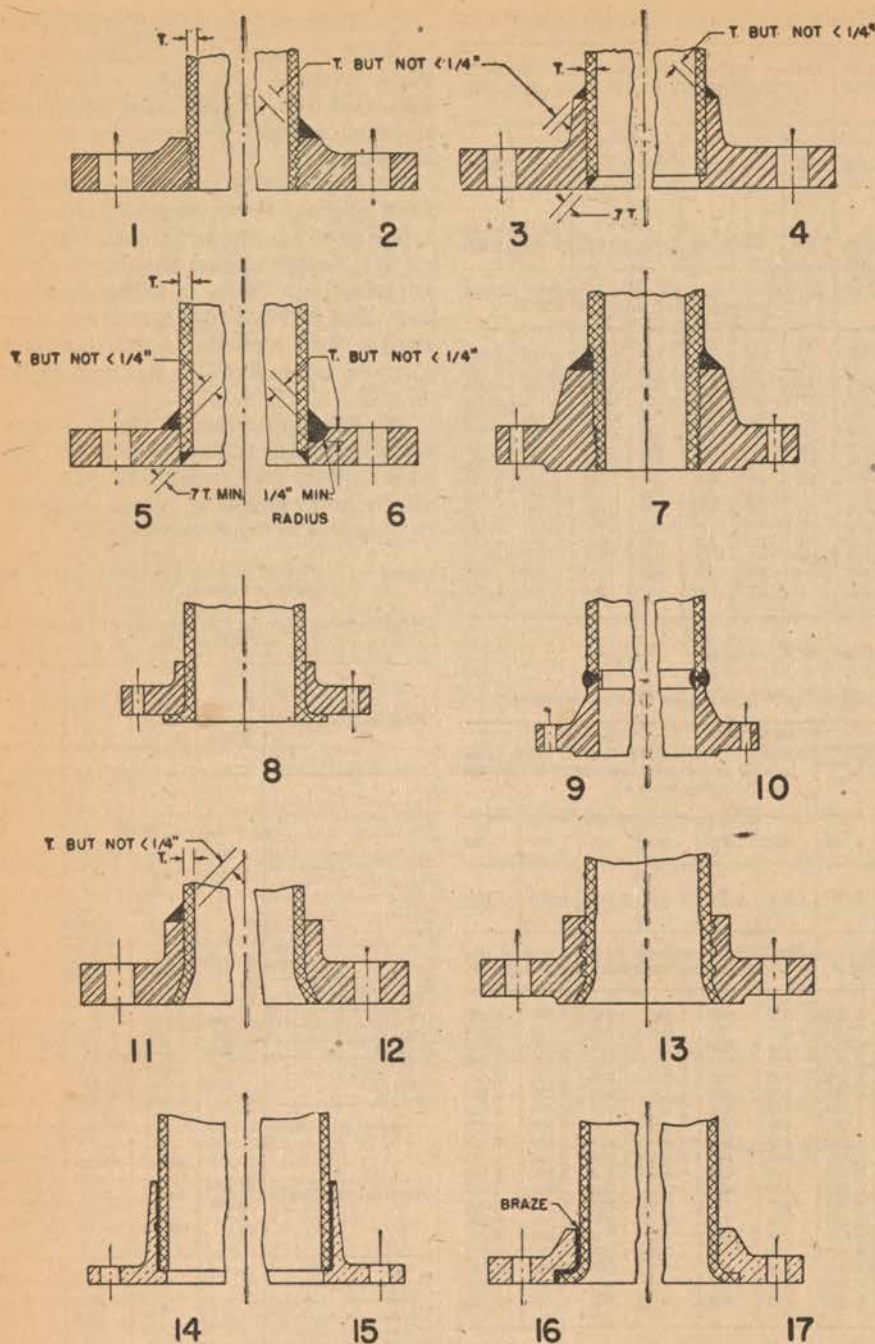


FIGURE 55.07-15 (f)—Acceptable types of flange connections.

Figure 55.07-15 (f1). Flanges with screwed threads may be used for class I piping not exceeding 2 inches nominal pipe size. For class II piping, flanges with screwed threads may be used without diameter limitation.

Figure 55.07-15 (f2). Low hub flanges with screwed threads plus the addition of a strength fillet weld of the size as shown may be used for class I piping for pressures not to exceed 300 pounds per square inch and for temperatures not exceeding 750° F.

Figure 55.07-15 (f3). Slip-on flanges may be used for class I piping for nominal pipe size not exceeding 2½ inches and for class II piping without diameter limitation. The face of the flange shall extend beyond the end of the pipe at least equal to the thickness of the pipe wall and the flange shall be attached as shown by figure 55.07-15 (f3).

Figure 55.07-15 (f4). Socket welding flanges may be used for class I piping of nominal pipe size not exceeding 2½ inches.

For class II piping, socket welding flanges may be used without diameter limitation.

Figure 55.07-15 (f5). Flanges machined from steel plate may be used for class II piping for pressures not exceeding 125 pounds per square inch provided the steel plate meets the requirements of subpart 51.22. The machined flanges shall comply with table 55.07-15 (e3). The face of the flanges shall extend beyond the end of the pipe at least equal to the thickness of the pipe wall and shall be attached as shown by figure 55.07-15 (f5).

Figure 55.07-15 (f6). Steel plate flanges meeting the requirements listed for figure 55.07-15 (f5) may be used for class II piping for pressures exceeding 125 pounds per square inch provided the flange is attached to the pipe as shown by figure 55.07-15 (f6).

Figure 55.07-15 (f7). Pipe may be attached to high hub flanges where the end of the pipe and the bore of the flange are machined to a

snug fit and the hub welded to the pipe as shown by figure 55.07-15 (f7).

Figure 55.07-15 (f8). Lap joint flanges (Van Stone) may be used for class I and class II piping. The Van Stone equipment shall be operated by qualified personnel and the ends of the pipe shall be heated from 1650° to 1900° F. dependent upon the size of the pipe prior to the flanging operation. The foregoing temperatures shall be carefully adhered to in order to prevent excess scaling of the pipe. The extra thickness of metal built-up in the end of the pipe during the forming operation shall be machined to restore the pipe to its original diameter. The machined surface shall be free from surface defects and the back of the Van Stone lap shall be machined to a fine tool finish to furnish a line contact with the mating surface on the flange for the full circumference as close as possible to the fillet of the flange. The number of heats to be used in forming a flange shall be determined by the size of the pipe and not more than two push-ups per heat are permitted. The width of the lap flange shall be at least three times the thickness of the pipe wall and the end of the pipe shall be properly stress-relieved after the flanging operation is completed. Manufacturers desiring to employ this type of joint shall demonstrate to an inspector that they have the proper equipment and personnel to produce acceptable lap joints.

Figure 55.07-15 (f9). Welding neck flanges may be used on any piping provided the flanges are butt welded to the pipe. The joint shall be welded as indicated by figure 55.07-15 (f9) and a backing ring employed which will permit complete penetration of the weld metal.

Figure 55.07-15 (f10). Welding neck flanges may also be attached to pipe by double-butt welds as shown by figure 55.07-15 (f10).

Figure 55.07-15 (f11). Flanges may be attached by shrinking the flange on to the end of the pipe and flaring the end of the pipe to an angle of not less than 20°. A fillet weld of the size shown by figure 55.07-15 (f11) shall be used to attach the hub to the pipe. This type of flange is limited to a maximum pressure of 250 pounds per square inch at temperatures not exceeding 500° F.

Figure 55.07-15 (f12). The flange of the type described and illustrated by figure 55.07-15 (f11) may be used for class II piping with fillet weld omitted.

Figure 55.07-15 (f13). Flanges may be attached by expanding the pipe into the grooves machined in the hub of the flange and flaring the end of the pipe to an angle of not less than 20°. This type of flange is limited to a maximum pressure of 250 pounds per square inch at a temperature not exceeding 500° F. For class II piping, it is not required that the ends of the pipe be flared.

Figure 55.07-15 (f14). Copper-alloy flanges may be used for temperatures not exceeding 406° F. The hub of the flange shall be bored to a depth of not less than that required for a threaded connection of the same diameter leaving a shoulder for the pipe to butt against. An annular groove of depth of not less than that required for a pipe thread of the same diameter shall be machined inside the hub of the flange. A preinserted ring of silver brazing alloy having a melting point of not less than 800° F. and of sufficient quantity to fill the annular clearance between the flange and the pipe shall be inserted in the groove. The pipe shall then be inserted in the flange and sufficient heat applied externally to melt the brazing alloy until it completely fills the clearance between the hub of the flange and the pipe. A suitable flux shall be applied to the surfaces to be joined to insure an acceptable joint.

Figure 55.07-15 (f15). The type of flange as described for figure 55.07-15 (f14) may be employed and, in lieu of an annular groove being machined in the hub of the flange for

the preinserted ring of silver brazing alloy, a bevel may be machined on the end of the hub and the silver brazing alloy introduced from the end of the flange to attach the pipe to the flange.

Figure 55.07-15 (f16). Flanges may be attached to nonferrous pipe by inserting the pipe in the flange and flanging the end of the pipe into the recess machined in the face of the flange to receive same. The width of the flange shall be not less than three times the pipe wall thickness. In addition thereto, the pipe shall be securely brazed to the wall of the flange. This flange is limited to a maximum temperature of 406° F.

Figure 55.07-15 (f17). The flange of the type described and illustrated by figure 55.07-15 (f16) may be used for class II piping with the brazing omitted.

TABLE 55.07-15 (J2)—CAST IRON FLANGED FITTINGS AND COMPANION FLANGES, CLASS 250

[250-pound cast-iron flanges. All dimensions given in inches]

Nominal pipe size ^{2,3}	Diameter of flange	Thickness of flange (minimum)	Diameter of bolt circle	No. of bolts	Size of bolts
1	4 1/4	1 1/16	3 1/2	4	5/8
1 1/4	5 1/4	1 1/8	3 3/4	4	5/8
1 1/2	6 1/4	1 3/16	4 1/2	4	3/4
2	6 3/4	7/8	5	8	5/8
2 1/2	7 1/2	1	5 3/4	8	3/4
3	8 1/4	1 1/8	6 3/4	8	3/4
3 1/2	9	1 1/16	7 1/4	8	3/4
4	10	1 1/4	7 3/4	8	3/4
5	11	1 3/8	9 1/4	8	3/4
6	12 1/4	1 7/8	10 3/4	12	3/4
8	15	1 5/8	13	12	7/8
10	17 1/4	1 3/4	15 1/4	16	1
12	20 1/4	2	17 3/4	16	1 1/8
14 O. D.	23	2 1/8	20 1/4	20	1 1/8
16 O. D.	25 1/4	2 1/4	22 1/2	20	1 1/4
18 O. D.	28	2 3/8	24 3/4	24	1 1/4
20 O. D.	30 1/4	2 1/2	27	24	1 1/4
24 O. D.	36	2 3/4	32	24	1 1/2
30 O. D.	43	3	39 1/4	28	1 3/4

Nominal pipe size ^{2,3}	Metal thickness (minimum)	Diameter of hub (minimum)	Length through hub (minimum)	Length of threads ⁴ (minimum)
1	1/8	2 1/4	7/8	0.68
1 1/4	1/8	2 1/4	1	0.76
1 1/2	1/8	2 3/4	1 1/8	0.87
2	1/8	3 1/4	1 1/4	1.00
2 1/2	1/8	3 3/4	1 3/8	1.14
3	1/8	4 1/4	1 3/4	1.20
3 1/2	1/8	4 3/4	1 3/4	1.25
4	1/8	5 1/4	1 3/4	1.30
5	1/8	6 1/4	1 3/4	1.41
6	1/8	7 1/4	1 3/4	1.51
8	1/8	10 1/4	2 3/8	1.71
10	1/8	12 3/4	2 3/4	1.92
12	1/8	14 3/4	2 3/4	2.12
14 O. D.	1/8	16 1/4	2 1/2	2.25
16 O. D.	1/8	18 3/8	2 3/4	2.45
18 O. D.	1/8	20 3/8	3 1/8	2.65
20 O. D.	1/8	22 3/4	3 3/8	2.85
24 O. D.	1/8	27 3/8	3 1/2	3.25
30 O. D.	2			

¹ All 250-pound cast-iron standard flanges have a 1/8-inch raised face. This raised face is included in the minimum thickness of flange dimensions.

² Sizes 14 inches and larger are to be used with O. D. pipe of the same sizes.

³ All blind flanges for sizes 10 inches (17 1/4 inches O. D.) and larger must be dished, with inside radius equal to the port diameter.

⁴ This column is the same as column for effective thread (E) in table 1 of the American Pipe Thread Standard, published by the American Engineering Standards Committee, except in sizes 1 1/4, 1 1/2, and 2 inches.

§ 55.07-20 Bolting—(a) Scope. (1) Valves, fittings, and flanges for piping

systems shall have bolting complying with the standards for the various pressure ratings as given in tables 55.07-15 (e1) to 55.07-15 (e9), inclusive. For pressure vessels and other special flange designs the aforementioned standards are not mandatory and the bolting stress may be calculated as required in this section.

(2) Studs continuously threaded, or bolts with the unthreaded portion reduced to the same diameter as that of the root of the thread, shall be employed when the design temperature exceeds 450° F.

(3) American Standard heavy nuts shall be employed for class I piping and for pressure vessels where the pressure or the temperature design of same exceeds that permitted for class II piping (maximum temperature of 450° F.).

(b) Materials. (1) When the temperature does not exceed 450° F., carbon-steel bolting material may be used for attaching heads, doors, covers, or flanges. For temperatures exceeding 450° F., bolting material complying with the requirements of subpart 51.49 shall be employed.

(2) Nut material for alloy-steel bolting shall comply with subpart 51.55. Nuts shall be semifinished, chamfered and trimmed, and shall meet the minimum requirements of American Standard heavy dimensions as given in table 55.07-20 (b). Washers are not required, but when used, same shall be of forged or rolled steel.

(3) Bolting shall have a length of thread engagement of not less than the normal thickness dimension of American Standard heavy nuts. In no case shall the size of a bolt be less than 1/2 inch in diameter.

TABLE 55.07-20 (b)—BOLTING AND NUTS

[All dimensions given are in inches]

Bolting	American Standard Heavy Nuts semifinished hexagon			
	Width across flats, minimum		Nut thickness	
Diameter	Root area	Number of threads ¹	Nominal	Minimum
1/2	0.126	13	0.850	0.969
5/16	0.162	12	0.906	1.033
3/8	0.202	11	1.031	1.175
1/2	0.302	10	1.213	1.383
5/8	0.419	9	1.394	1.589
3/4	0.551	8	1.575	1.796
7/8	0.728	7	1.756	2.002
1	0.929	6	1.928	2.209
1 1/4	1.155	5	2.119	2.416
1 1/2	1.405	4	2.300	2.622
1 3/4	1.680	3	2.481	2.828
2	1.980	2	2.663	3.036
2 1/4	2.304	1	2.844	3.242
2 3/4	2.652	1	3.025	3.449

¹ All bolting shall have threads at least as strong as American Standard screw threads.

(c) Bolt loads—(1) Minimum required bolt load. The minimum bolt load W_m shall be determined from the greater of the values obtained from formula (1) under maximum operating conditions, or from formula (2) under atmospheric temperature conditions without consideration of internal pressure.

(i) Under maximum operating conditions:

$$W_m = H + H_p = 0.785G^2P + (2b \times 3.14G \times m \times P)$$

(ii) Under atmospheric temperature conditions without internal pressure:

$$W_m = H_y = 3.14b \times G \times y \times r \quad (2)$$

where:

W_m —minimum required bolt load, in pounds.

H —total hydrostatic end force, in pounds.

H_p —total joint-contact surface compression load, in pounds.

G —mean diameter of gasket or joint-contact surface, in inches (except for lap joints with full face gasket in which case it is midpoint of contact between flange and lap).

P —maximum allowable pressure, in pounds per square inch.

b —effective gasket or joint-contact surface seating width, in inches (see table 55.07-20 (c1)).

m —unit contact compression factor (see table 55.07-20 (c1)).

H_y —total joint-contact seating load, in pounds.

y —gasket or joint-contact surface unit seating load, in pounds per square inch (see table 55.07-20 (c1)).

r —ratio of allowable bolt stress at maximum metal temperature to allowable bolt stress at atmospheric temperature.

NOTE 1: Under maximum operating conditions, the minimum required bolt load W_m is the load required to resist the hydrostatic end force H exerted by the maximum internal pressure upon the area bounded by the mean diameter of gasket or joint-contact surfaces and, in addition, maintain a predetermined compression load H_p on the gasket or joint-contact surface which, experience has shown, will be sufficient to insure a tight joint.

NOTE 2: Under atmospheric temperature conditions without internal pressure, the minimum required bolt load W_m is the load H_y required to initially seat the gasket or joint-contact surfaces sufficiently to insure a tight joint.

(2) Actual bolt load. The actual bolt load W_a shall be not less than that calculated by paragraph (c) (1) of this section, which is the force in pounds when the actual total bolt area is stressed to the design stress permitted for the maximum metal temperature, and shall be calculated by the following formula:

$$W_a = A_b \times S_b \quad (3)$$

where:

W_a —actual or allowable bolt load, in pounds.

A_b —total cross-sectional area of bolts at root of thread or section of least diameter under stress, in square inches.

S_b —allowable bolt stress at maximum metal temperature, in pounds per square inch (see table 55.07-20 (c2)).

TABLE 55.07-20 (c1)—GASKET DATA

GASKET FACTORS (M) FOR OPERATING CONDITIONS, YIELD POINT Y			EFFECTIVE GASKET YIELDING WIDTH	
GASKET MATERIAL	GASKET YIELD FACTOR POINT M	SKETCH AND NOTES	FACING SKETCH (EXAGGERATED)	EFFECTIVE GASKET YIELD WIDTH B
A. GUM RUBBER SHEET	.50 500		①	$\frac{n}{2}$
B. CLOTH-INSERTED SOFT RUBBER OR HARD RUBBER SHEET	.75 750		②	$\frac{n+w}{4}$
C. CLOTH-INSERTED HARD RUBBER	1.00 1000		③	$\frac{n}{4}$
D. VEGETABLE FIBRE SHEET	1.50 2000		④	$\frac{n}{3}$
E. COMPRESSED ASBESTOS OR ASBESTOS COMPOSITION	2.50 4500		⑤	$\frac{n}{4}$
F. WIRE MESH REINFORCED ASBESTOS	2.50 4500		⑥	$\frac{w}{8}$
G. CORRUGATED METAL ASBESTOS INSERTED, OR SPIRAL-WOUND METAL, ASBESTOS FILLED	2.50 4500	FACING ①, TABLE B ONLY.	⑦	
H. CORRUGATED METAL JACKET, ASBESTOS FILLED	3.00 6000	FACING ①, TABLE B ONLY.	⑧	
J. CORRUGATED METAL	A) COPPER 3.00 6000 B) MONEL 3.25 7000 C) IRON D) SOFT STEEL	FACING ①, TABLE B ONLY.	⑨	
K. FLAT METAL JACKET, ASBESTOS FILLED	A) ALUMINUM 3.25 7000 B) COPPER C) MONEL D) IRON E) SOFT STEEL 3.50 8000 F) 14-6% CR G) 11-13% CHROME H) 1 CR-NI I) 1 CR-NI-MO 3.75 9000		⑩	
L. SOLID METAL	A) SOFT ALUMINUM 4.00 10000 B) SOFT COPPER 4.75 14000 C) ADMIRALTY D) IRON E) SOFT STEEL 5.50 16000 F) MONEL G) 14-6% CHROME H) 11-13% CHROME 6.00 21000 I) 1 CR-NI J) 1 CR-NI-MO 6.50 24500		⑪	

1 16-20 PERCENT CHROMIUM, 8-10 PERCENT NICKEL

2 16-18 PERCENT CHROMIUM, 10-14 PERCENT NICKEL, 1.75-2.50 PERCENT MOLYBDENUM

TABLE 55.07-20 (c2)—ALLOWABLE BOLT STRESSES

Specification subpart	Grade	For metal temperatures not exceeding °F.			
		-20 to 650	700	750	800
51.49	BA	13,000	12,000	10,900	-----
51.49	BB	15,000	13,800	12,500	-----
51.49	BC	16,000	14,700	13,400	-----
51.49	B4	16,000	16,000	16,000	16,000
51.49	B5	16,000	16,000	16,000	16,000
51.49	B6	16,000	14,700	13,400	11,500
51.49	B7	16,000	16,000	16,000	16,000
51.49	B7a	16,000	16,000	16,000	16,000
51.49	B8	15,000	15,000	14,000	14,300
51.49	B8F	15,000	15,000	14,000	-----
51.49	B11	16,000	16,000	16,000	16,000
51.49	B12	16,000	14,700	13,400	-----
51.49	B13	16,000	16,000	16,000	16,000
51.49	B14	16,000	16,000	16,000	16,000
51.49	B15	16,000	16,000	16,000	16,000
51.52	-----	16,500	-----	-----	-----

Specification subpart	Grade	For metal temperatures not exceeding °F.			
		850	900	950	1000
51.49	BA	-----	-----	-----	-----
51.49	BB	-----	-----	-----	-----
51.49	BC	-----	-----	-----	-----
51.49	B4	13,000	10,000	-----	-----
51.49	B5	13,800	11,000	8,300	5,900
51.49	B6	9,500	6,800	-----	-----
51.49	B7	13,000	10,000	-----	-----
51.49	B7a	13,800	11,000	8,300	5,900
51.49	B8	14,000	13,400	12,300	10,000
51.49	B8F	-----	-----	-----	-----
51.49	B11	13,800	11,000	8,300	5,900
51.49	B12	-----	-----	-----	-----
51.49	B13	13,800	11,000	8,300	5,900
51.49	B14	15,000	13,300	11,400	8,800
51.49	B15	13,800	11,000	8,300	5,900
51.52	-----	-----	-----	-----	-----

1 Material not permitted for temperatures exceeding 450° F.

§ 55.07-25 *Installation.* (a) Piping shall not be located above switchboards or other electrical equipment if practicable; but, where it cannot be avoided, means shall be provided to prevent water from dripping upon and injuring the equipment.

(b) Reduced-pressure lines shall be fitted with efficient reducing valves, pressure gauges and relief valves installed on the low pressure side having sufficient discharge capacity to prevent the pressure exceeding that for which the piping is designed.

(c) Piping shall be provided with means of support sufficient to take all the weight of the piping, valves, and fittings. Hangers, supports, and anchorage shall be so arranged as not to interfere with the expansion and contraction of the piping.

(d) Where pipes are led through watertight bulkheads, flanges or special 3-flange bulkhead fittings shall be used, and in no case shall it be permissible for the plating of a bulkhead to form a part of the joint.

(e) Stuffing boxes are not permitted on deep-tank bulkheads, double bottoms, or in any place where they cannot be readily examined. This does not apply to Great Lakes cargo vessels or tank vessels.

(f) Under no circumstances shall piping, fittings, or connections be installed in such manner that the operation of the safety valve will be impaired.

(g) Where vessels are fitted with more than one boiler, the auxiliary piping shall be so arranged that the steam whistle,

steering gear, and electric-lighting plant can be operated from either of two boilers.

(h) Piping may be run through deep tanks or fuel tanks, provided a pipe tunnel is installed. Where a pipe tunnel is installed, the watertight integrity of the bulkheads shall be maintained, and if the tunnel is not of sufficient size to afford easy access, no valve or fitting shall be located therein. Bilge and ballast piping may be run through such tanks without a pipe tunnel, provided the piping is extra heavy, expansion bends are fitted, and all joints within the tanks are welded.

(i) Where pipes are run through cargo spaces and coal bunkers, they shall be substantially encased to protect them from mechanical injury. In coal bunkers such casings shall be made of steel.

(j) The faces of flanges shall be parallel before being bolted together.

(k) (1) On new installations or replacements for vessels of 150 gross tons and over, cast iron for any connection to the vessel's shell below the freeboard deck is not permitted, nor shall cast-iron valves be secured to sea chests.

(2) On ocean and coastwise vessels constructed prior to June 15, 1941, in which cast-iron sea chests were installed, reinforcing with concrete or other suitable material in conjunction with structural bracing shall be fitted.

(l) Provision shall be made for expansion either by expansion bends, slip joints, or other approved means.

(m) All steam piping shall be fitted with adequate means for draining the pipe at all points where there is a possibility of water accumulating.

(n) Class I copper pipes shall be properly stress-relieved before installation.

(o) Valves and cocks shall be located so as to be easily accessible.

(p) Where the blow-off piping discharges above the load line of the vessel, it shall be arranged so that the discharge is deflected downward in order to protect persons who may be alongside the vessel.

(q) Valves so designed as to form pockets in which sediment may collect shall not be used for blow-off purposes.

§ 55.07-30 *Hydrostatic tests.* (a) Piping shall be hydrostatically tested as follows:

(1) Class I steam, feed, and blow-off piping with flanges attached, to a pressure of not less than twice the maximum allowable pressure of the boilers or feed pumps in the case of feed piping, but not more than the working pressure plus 1,000 pounds per square inch. After installation the aforementioned piping shall be tested to one and one-half times the maximum allowable pressure.

(2) Class I welded piping irrespective of service to twice the maximum allowable pressure.

(3) Where the piping is fabricated in place aboard the vessel it shall be subjected only to twice the maximum allowable pressure or the allowable pressure plus 1,000 pounds per square inch whichever is the lesser.

(4) Hydrostatic tests shall be witnessed by an inspector.

(b) Steel valves and fittings shall be tested by their manufacturer to a hydrostatic pressure in accordance with the requirements of tables 55.07-15 (e10) and 55.07-15 (e11). Bronze, cast iron, or malleable iron valves and fittings for steam service or other services at temperatures exceeding 150° F. shall be tested by their manufacturer to a hydrostatic pressure of not less than two and one-half times their steam working pressure. Bronze valves and fittings for high-pressure hydraulic or air service at temperatures not exceeding 150° F. shall be tested by their manufacturer to a hydrostatic pressure of not less than one and one-half times their hydraulic or air working pressure.

SUBPART 55.10—PUMPING ARRANGEMENTS AND PIPING SYSTEMS

§ 55.10-1 Bilge pumps—(a) General. All vessels shall be provided with an efficient pumping plant, capable of pumping from and draining any watertight compartment under all practicable conditions, whether the vessel is upright or listed. For this purpose wing suction will generally be necessary, except in narrow compartments at the ends of the vessel. Where close ceiling is fitted over tank tops or bilges, arrangements shall be made whereby water in the compartment may find its way to the suction pipes. Efficient means shall be provided for the proper drainage of all tank tops, other watertight flats, and insulated holds.

(b) *Pumping arrangements.* Bilge pumps shall be provided as follows:

(1) *Large ocean-going passenger vessels.* In the case of ocean-going passenger vessels navigating more than 200 miles offshore, and which are 300 feet or more in length on the load water line, three power pumps are required on a bilge system, at least two of which shall be independent of the propelling unit. One of the power pumps shall be an emergency pump of a reliable, submersible type. The source of power situated above the bulkhead deck shall be available for this pump in any case of emergency. The necessary cocks and valves for controlling the bilge suction in each compartment shall be so arranged and operated from the bulkhead deck that, in the event of flooding, the emergency pump may be operated on any compartment.

(2) *Small ocean-going passenger vessels.* The foregoing requirements shall also apply to ocean-going passenger vessels of less than 300 feet in length on the load water line, except that two hand pumps may be substituted for one of the power pumps.

(3) *Cargo vessels.* Vessels above 180 feet in length on the load water line shall be provided with three power pumps; and below 180 feet on the load water line, two power pumps. One of the required power pumps may be attached to the main engine. For all tank vessels having a bilge pump located in the forward end of the vessel, this pump may be considered one of the required power pumps.

(4) *Inland and other vessels.* For vessels engaged in inland water service and other vessels not exceeding 180 feet in length on the load water line, steam syphons may be substituted for pumps

attached to the main propelling unit, but where used they shall be made a permanent fixture in the vessel, and at least one shall be installed in each hold or compartment where bilge suction is required. The capacity of such syphons shall be satisfactory to the Officer in Charge, Marine Inspection, in the district where installed.

(c) *Exception for Great Lakes cargo vessels.* Great Lakes cargo vessels are required to be provided with ample means for pumping and draining watertight compartments, but in view of their peculiar construction to suit service conditions under which they operate, they are not required to meet the requirements of paragraph (b) of this section.

(d) *Location.* Where practicable, the power bilge pumps shall be placed in separate, watertight compartments.

(e) *Other pumps.* Sanitary, ballast, and general service pumps may be accepted as independent power bilge pumps if fitted with the necessary connections to the bilge-pumping system.

(f) *Independent power bilge pumps.* The independent power bilge pumps required by paragraph (b) of this section shall be capable of drawing the water through their suction pipes at a velocity of not less than 400 feet per minute under ordinary working conditions.

§ 55.10-5 Bilge and ballast piping.

(a) The internal diameter of bilge suction pipes shall be determined by the following formulas, except that the nearest commercial size not more than 1/4 inch under the required diameter may be used:

(1) For suction to each main bilge pump:

$$d = \sqrt{\frac{L(B+D)}{2,500}} + 1 \text{ inch} \quad (1)$$

(2) For branch suction to cargo and machinery spaces:

$$d = \sqrt{\frac{l(B+D)}{1,500}} + 1 \text{ inch} \quad (2)$$

where:

L—length of vessel at load water line, in feet.

B—breadth of vessel, in feet.

D—molded depth to bulkhead deck, in feet.

l—length of compartment, in feet.

d—required internal diameter of suction pipe, in inches.

NOTE: For tank vessels *L* may be reduced by the combined length of the cargo oil tanks.

(b) Main bilge suction piping shall be not less than 2½ inches internal diameter. Branch suction piping need not be more than 4 inches nor less than 2 inches in diameter, except for drainage of small pockets or spaces in which case 1½-inch diameter may be used.

(c) The number, location, and size of bilge suction in the boiler and machinery compartments shall be determined by the Officer in Charge, Marine Inspection, in the district where the vessel is being built when the piping arrangement is submitted for approval and shall be based upon the size of the compartments and the drainage arrangements. One of the independent bilge pumps shall have a suction of a diameter not less than that given by formula (2), from the

engine-room bilge, entirely independent of the bilge main, and on ocean-going passenger vessels each of the independent bilge pumps shall have such a suction from the compartment in which it is located.

(d) Lead pipes shall not be installed under coal bunkers or fuel-oil storage tanks, nor in boiler or machinery spaces, including motor rooms in which oil-settling tanks or fuel-oil pump units are located. Where such piping is permitted, it shall be adequately protected.

(e) Main circulating pumps shall be fitted with direct suction connections provided with nonreturn valves in the machinery space. The diameter of such suction piping shall be not less than two-thirds of the diameter of the main sea inlet. Where coal is used as fuel and no watertight bulkhead is provided between the engine and boiler rooms, a direct discharge overboard shall be fitted from at least one circulating pump, or a bypass may be fitted to the circulating discharge.

(f) For internal-combustion engine installations, the emergency bilge suction shall be connected to the largest available pump in the engine room and shall have an area equal to the full suction inlet of the pump. This requirement is in addition to the independent bilge suction stipulated in paragraph (c).

(g) All piping required for draining cargo or machinery spaces shall be separate from piping which is used for filling or emptying spaces where water or oil is carried, and shall be controlled by separate valves at the pumps so arranged as to preclude the entrance of water and oil into cargo and machinery spaces.

(h) Bilge suction shall be led from manifolds, which shall be arranged to be controlled above the floor plating of the compartment in which they are located, and shall be easily accessible at all times. Each individual bilge suction shall be provided with a suitable strainer and, in addition thereto, a mud box or basket strainer shall be provided in suitable location between the manifold and the pump.

(i) On passenger vessels provision shall be made to prevent the compartment served by any bilge suction pipe from being flooded in the event of the pipe being severed or otherwise damaged by collision or grounding in any other compartment. For this purpose, where the pipe is in any part situated near the side or in a duct keel, there shall be fitted to a pipe, in the compartment which it serves, either a screw-down valve or a stop-check lift valve, either of which shall be capable of being operated from above the bulkhead deck.

(j) All sea cocks or other fittings attached to the plating of a vessel shall be arranged to be operated in an accessible place above the level of the floor plating of the compartment in which they are located.

§ 55.10-10 Oil transfer and filling systems. (a) Oil-piping systems for the transfer or discharge of cargo or fuel oil shall be separate from other piping systems as far as practicable, and dependable means shall be provided to prevent dangerous interconnection in service.

(b) Manifolds and valves shall be located in accessible places, preferably on the bulkheads, and shall be distinctly and permanently marked to indicate the tank or compartment to which they are connected.

(c) Filling pipes may be led directly from the deck into the tanks, or to a manifold in an accessible location from which the oil can be distributed through the piping to the various tanks.

(d) Where filling or suction pipes enter deep tanks, peak tanks, or settling tanks at a level where the piping may be exposed to a head pressure from the tank, shut-off valves shall be installed at the bulkhead, preferably on the inside of the tank, but such valves may be installed on the outside of the tank provided they are made of forged or cast steel and properly welded or bolted to the tank, and adequately protected against mechanical injury by steel guards. All such valves shall be fitted with an efficient mechanical means for operating from an open and accessible space on deck outside of the machinery and boiler casing, the operating rods to be properly protected.

(e) The intake end of filling pipes shall be fitted with a shut-off valve and a blank flange or screwed cap which shall be kept closed when not in use.

(f) Where heating coils are necessary, they shall be made of seamless or extra heavy steel piping. For piping at the bulkhead, bolted flanged joints are required. All other joints within tanks are recommended to be welded.

(g) In fuel-oil tanks, sections of piping for heating the oil may be joined by welding in lieu of flange connections. The two sections to be joined shall be butted and a sleeve shall cover the joint. The sleeve shall be of the same material, its length shall be at least $\frac{1}{2}$ inch more than the diameter of the pipe and it shall be located with the joint midway of its length. The ends of the sleeve shall be welded to the pipe. An approved form of saddle butt-welded joint may be used in lieu of the sleeve joint. The welding shall be done by qualified welders.

§ 55.10-15 *Vent, overflow, and sounding pipes*—(a) *Vent pipes*. All tanks used for carrying fuel oil shall be fitted with vent pipes in accordance with the following requirements:

(1) Fuel-oil settling tanks and similar tanks having a comparatively small surface shall be fitted with at least one vent pipe. Tanks having a comparatively large surface shall be fitted with at least two vent pipes, one of which shall be located at the highest part of the tank. Where fuel-oil tanks are filled by pump pressure or by gravity of exceptional head, the aggregate area of vent pipes shall be at least equal to the filling connection at the tank unless other overflows are provided. In no case shall the diameter of any vent pipe be less than $2\frac{1}{2}$ inches.

(2) Vent pipes shall terminate in an open space on deck and shall be fitted with U-bends fitted with a wire-gauze diaphragm. Suitable means for closing vent pipes in an emergency shall be provided where necessary.

(3) Vent pipes shall be led as direct as practicable and the inclination in all cases shall not be less than 30° from the horizontal, except where both ends are adequately drained to a tank.

(b) *Overflow tanks*. Where overflow pipes are fitted to fuel-oil tanks, they shall conform to the following requirements:

(1) The area of the overflow pipe for fuel-oil tanks shall equal at least the area of the filling connection to the tank.

(2) Overflow pipes equipped to discharge through the ship's side shall be located as far above the load line as practicable, and shall be provided with nonreturn valves located on the ship's side. For ocean-going passenger vessels there shall be provided in addition to the aforementioned nonreturn valve an efficient accessible and positive means for preventing water from passing inboard. Such means may consist of another nonreturn valve in an accessible position above the deepest load line.

(c) *Sounding pipes*. All tanks and hold compartments which are not at all times accessible shall be fitted with sounding pipes in accordance with the following requirements:

(1) Sounding pipes shall not be less than $1\frac{1}{2}$ inches inside diameter.

(2) The pipes shall be led as straight as possible from within 2 inches of the lowest part of the tank or compartment to the bulkhead deck or other position which is always accessible. Where sounding pipes terminate below the bulkhead deck they shall be provided with a valve at the top. In passenger vessels a self-closing valve shall be required; in cargo vessels a gate valve may be used.

(3) The upper ends of sounding pipes terminating at a deck shall be protected by a screw cap or plug. No perforations or openings throughout the length of the pipe are permitted.

(4) Striking plates or fittings shall be provided under the sounding pipes to protect the hull plate from injury.

§ 55.10-20 *Fuel-oil service piping*. (a) All discharge piping from the fuel-oil service pumps to the burners shall be of extra heavy seamless steel conforming to the requirements of subparts 51.34 and 51.37.

(b) All valves and fittings used on fuel-oil discharge lines shall be extra strong. Cast-iron valves and fittings are not permitted for discharge lines in the service system.

(c) All fuel-oil discharge piping, after being assembled, shall be subjected to a hydrostatic pressure of not less than 500 pounds per square inch. This test shall be witnessed and certified to by an inspector.

(d) Bushings and street ells shall not be used in connection with fuel-oil discharge piping.

(e) Where screwed bonnet valves are used for this service, they shall be of the union-bonnet type.

(f) On all ocean and coastwise vessels, two separate pumping units are required to supply oil to the burners.

(g) The discharge piping from pumps to burners shall be fitted with a relief valve which shall be in a closed circuit;

that is, discharged into the suction line, or back into the tank.

(h) Fuel oil service pumps shall be equipped with means of control from a readily accessible position outside of the boiler room which will always be accessible in the event of fire occurring in the compartment in which they are located.

§ 55.10-25 *Independent fuel piping (emergency units)*—(a) *Scope*. Vessels carrying passengers shall be allowed to carry such quantities of gasoline or any of the products of petroleum as may be necessary to supply the emergency lighting and/or wireless system when contained in tanks constructed and installed in accordance with §§ 55.10-30 and 55.10-35.

(b) *Outage*. When filling the tanks with gasoline or other petroleum products, an outage of 2 percent shall be provided.

(c) *Piping connections*. (1) The fuel piping for all tanks shall comply with the applicable requirements of this part.

(2) The piping shall be run in sight wherever practicable, and shall be protected from mechanical injury and effectively secured against vibration.

(3) The filling pipe shall enter the top of the tank. If the filling pipe is run nearly to the bottom of the tank, it may serve as a combined filling and sounding pipe.

(4) The supply pipe to the engine shall enter the top of the tank and extend nearly to the bottom of the tank. The return pipe from the engine shall enter the top of the tank.

(5) Shut-off valves or cocks of a suitable type shall be installed in supply lines and located in accessible positions at the tank.

(6) Similar shut-off valves shall be located in the supply lines close to the carburetor or fuel pumps.

(7) Outlets for drawing fuel are not permitted in engine compartments.

(8) Open drains for removing water from the fuel tanks are not permitted.

(d) *Filling and sounding connections*. Filling and sounding pipes for fuel tanks shall terminate on deck and be fitted with suitable shut-off valves or deck plugs.

(e) *Vents*. Each tank shall be fitted with a vent the cross-sectional area of which shall be not less than the area of the filling pipe. The vents shall terminate in the atmosphere at least 2 feet above the deck and not less than 3 feet from any opening into living quarters. All vent pipes shall terminate with U-bends and shall be fitted with flame screens or approved flame arresters.

§ 55.10-30 *Independent gasoline tanks*—(a) *Capacity*. The supply of gasoline for emergency units shall be limited to 40 gallons.

(b) *Construction*. The tanks shall be of cylindrical form and may be constructed of any of the following materials: Wrought iron, mild steel, or of corrosion-resistant alloys suitable for the purpose, and shall have a minimum thickness of $\frac{1}{8}$ inch. Tanks constructed of ferrous metals less than $\frac{3}{16}$ inch in thickness shall be galvanized by the hot-dipped process both inside and outside. Joints shall be riveted, brazed, or welded,

except that soldered joints may be used on small tanks of 20 gallons or less capacity, provided the solder used has a melting point of not less than 450° F. All spuds for pipe connections shall be securely riveted, welded, brazed, or soldered to the tank. No tubular gauge glasses or try-cocks shall be fitted to tanks.

(c) *Installation.* The tanks shall be located on the uppermost deck outside the engine compartment as close to the engine as practicable and so arranged as to permit a free circulation of air all around them. When installed, longitudinal seams shall be located as near the top of tank as practicable. The tanks shall be properly secured and accessible for complete external examination.

(d) *Tests.* Tanks shall be tested to a hydrostatic pressure of 15 pounds per square inch gauge after installation.

§ 55.10-35 *Independent heavy oil tanks*—(a) *Capacity.* The supply of heavy fuel oil for emergency units shall be limited to 15 long tons (2,240 pounds per ton).

(b) *Construction.* The tanks may be of either cylindrical or rectangular form and may be constructed of any of the following materials: Wrought iron, mild steel, or of any corrosion-resistant alloys suitable for the purpose. Tanks designed for capacities of 40 gallons or less shall have a minimum thickness of $\frac{1}{16}$ inch. Tanks designed for capacities of over 40 gallons shall have a minimum thickness of $\frac{1}{8}$ inch. Joints shall be riveted, brazed, or welded, except that soldered joints may be used on small tanks of 20 gallons or less capacity provided that the solder used has a melting point of not less than 450° F. Tanks shall be provided with swash plates and braces where necessary. The material used shall be the same as the tank. All spuds for pipe connections shall be securely riveted, welded, brazed, or soldered to the tank. No tubular gauge glasses or try-cocks shall be fitted to tanks.

(c) *Installation.* The tanks shall be located in an adequately ventilated steel or iron compartment on the deck above

the weather deck. Tanks exposed to a temperature in excess of 100° F. shall be properly insulated. No tank shall be located in any compartment where the temperature exceeds 150° F. When cylindrical tanks are installed, longitudinal seams shall be located as near the top of the tank as practicable. The tanks shall be properly secured and accessible for complete internal and external examination.

(d) *Tests.* Tanks shall be tested to a hydrostatic pressure of 10 pounds per square inch gauge after installation.

PART 56—ARC WELDING, GAS WELDING, AND BRAZING

SUBPART 56.01—ARC WELDING AND GAS WELDING

Sec.	
56.01-1	Scope.
56.01-5	Definitions.
56.01-10	Qualification of welders.
56.01-15	Automatic submerged arc welding.
56.01-20	Welding electrodes.
56.01-25	Class I welding.
56.01-30	Class II welding.
56.01-35	Class III welding.
56.01-40	Material.
56.01-45	Calculations.
56.01-50	Detail requirements.
56.01-55	Joints.
56.01-60	Welded nozzle connections.
56.01-65	Seal welding and tack welding.
56.01-70	Preheating and stress relieving.
56.01-75	Distortion.
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SUBPART 56.05—TESTS AND INSPECTION

56.05-1	Test plates.
56.05-5	Nondestructive tests.
56.05-10	Hydrostatic and hammer tests.
56.05-15	Inspection.

SUBPART 56.10—BRAZING

56.10-1	Definition.
56.10-5	Detail requirements.
56.10-10	Materials.
56.10-15	Thickness and maximum allowable pressure.
56.10-20	Types of joints.
56.10-25	Pipe joints.
56.10-30	Silver brazing.

AUTHORITY: §§ 56.01-1 to 56.10-30, inclusive, issued under R. S. 4405, 4417a, 4418, 4426, 4427, 4429, 4430, 4431, 4432, 4433, 4434, 4453, and 4491, as amended, sec. 14, 29 Stat. 690, 41 Stat. 305, 49 Stat. 1544, 54 Stat. 346 and

sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 363, 366, 367, 375, 391a, 392, 404, 405, 407, 408, 409, 410, 411, 412, 435, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946, 11 F. R. 7875.

SUBPART 56.01—ARC WELDING AND GAS WELDING

§ 56.01-1 *Scope.* (a) This part contains detail requirements for the fabrication of arc welded, gas welded, and brazed pressure vessels, furnaces, piping, valves, pipe fittings, and appurtenances subject to inspection by the Coast Guard.

(b) Drawings submitted for approval which show welded or brazed fabrication shall clearly indicate the type of joint to be used. Standard welding symbols of the American Welding Society shall be used to designate the type and size of welds.

§ 56.01-5 *Definitions.* In designating the various types of welding processes, types of joints, and welding nomenclature reference shall be made to the definitions of welding terms of the American Welding Society.

NOTE: A joint with filler metal added from only one side may be considered equivalent to a double-welded butt joint when satisfactory means are provided for securing complete penetration and reinforcement on both sides of the joint.

§ 56.01-10 *Qualification of welders.*

(a) Prior to fabricating the equipment listed in § 56.01-1, each welder shall pass the applicable tests specified in table 56.01-10 (a). The tests shall be made using the same type of equipment to be used in production, or with equipment equivalent thereto, with material and procedure of the same type as those intended to be used during production. The welding of test plates and testing of the required specimens shall be witnessed by an inspector.

NOTE: The tests specified herein bear the same number as, and are identical with, tests acceptable to the American Bureau of Shipping and the Bureau of Ships of the Navy Department. Welders qualified in accordance with these tests by an Inspector of the American Bureau of Shipping, or the Bureau of Ships of the Navy Department, will be acceptable to the Coast Guard.

TABLE 56.01-10 (a)—REQUIRED QUALIFICATION TESTS

	Positions in which welded joints are located on job		
	Flat, horizontal, vertical and overhead	Flat and vertical	Flat position only
On plate $\frac{3}{4}$ inch or less in thickness ^{1,2}	Test No. 1 in vertical and overhead positions.	Test No. 1 in vertical position.....	Test No. 1 in flat position.
On material of unlimited thickness ³	Test No. 2 in vertical and horizontal positions.	Test No. 2 in vertical position.....	Test No. 2 in flat position.
On piping or tubing $\frac{3}{4}$ inch or less in thickness ⁴	Test No. 3 with axis of pipe in horizontal and vertical fixed positions, provided welder has previously passed Test No. 1 or 2 in vertical and overhead positions.		Test No. 3 with axis of pipe in horizontal position and rolled provided welder has previously been qualified by Test No. 1 or 2 for the flat position.
On piping or tubing of unlimited thickness ^{4,5,6}	Test No. 4 in horizontal and vertical fixed positions.....		Test No. 4 in horizontal position and rolled.
For tack welders ⁷	Test No. 5 in vertical and overhead positions.	Test No. 5 in vertical position.....	
On material of unlimited thickness (for base metals of high conductivity).	Test No. 6 in vertical and overhead positions (for gas welding only).	Test No. 6 in vertical position (for gas welding only).	Test No. 6 in flat position (arc or gas welding).

¹ Where the maximum thickness of material on which a welder may have occasion to work throughout a period governed by a test is indeterminate, the inspector may, if desired, require the welder to qualify under unlimited thickness requirements.

² Where the maximum plate thickness to be welded in production is less than $\frac{3}{4}$ inch the contractor may, with the permission of the inspector, use the following modification of Test No. 1: The test plate thickness shall be the maximum to be welded in production, but shall not be less than $\frac{3}{16}$ inch. The root opening shall be not more than the diameter of the welding rod or electrode core wire to be used. The backing strap thickness shall not be less than $\frac{3}{16}$ inch.

³ Where the maximum plate thickness to be welded in production is between $\frac{3}{4}$ inch and 1 $\frac{1}{2}$ inches, Test No. 2 may, with the permission of the inspector, be conducted on plate of such maximum thickness.

⁴ Test Nos. 3 and 4 welded in the shop in the flat (downhand) position need not be welded in a confined space. A welder qualified to weld on plate in the vertical position may be permitted to weld on pipe in the flat position.

⁵ Welders qualified under the requirements of Test No. 4 will be considered as qualified to make welds governed by Test Nos. 1, 2, and 3 for the same positions.

⁶ The macro specimen indicated in figure 56.01-10 (d4) for Test No. 4 may be required at the option of the inspector and may be taken at any location in the joint.

⁷ Tack welding may be done by any welder qualified in accordance with Test No. 1, 2, 3, or 4.

(b) A welder doing satisfactory work continuously will not be required to be retested. A welder who has not been engaged in actual use of the welding process for which he was qualified for a period exceeding 3 months shall be required to pass the applicable tests before being permitted to resume work. A welder may be required by the inspector to repeat and pass the tests at any time if, in the inspector's opinion, the welder's work indicates a reasonable doubt as to his ability.

(c) In order to qualify, a welder shall pass the qualification tests for the type and thickness of material, the kind of

welding and position of work involved as specified in table 56.01-10 (a).
(d) Qualification Test Nos. 1, 2, 4, 5, and 6 shall be the welding of specimens in accordance with figures 56.01-10 (d1), 56.01-10 (d2), 56.01-10 (d4), 56.01-10 (d5), and 56.01-10 (d6), respectively. Qualification Test No. 3 shall be the welding, hydraulic testing and visual inspection of pipe assemblies or, as an alternative, removal of specimens for macroscopic inspection in accordance with figure 56.01-10 (g3).

(e) Specimens for Test Nos. 1, 2, and 4 shall be bent to the full capacity of the

jig shown in figure 56.01-10 (e) for 3/8-inch specimens. The plate for Test No. 5 shall be bent to fracture of the tack welds in the standard jig for 3/8-inch specimens. Specimens for Test No. 1, modified (see footnote No. 2 of table 56.01-10 (a)), and for Test No. 4 modified (see note No. 9 of figure 56.01-10 (d4)) shall be bent to the full capacity of a jig having a contour proportional to the thickness of the test specimens involved as indicated in figure 56.01-10 (e). Specimens for Test No. 6 shall be bent to the full capacity of a jig having a contour proportional to the thickness of the test specimens involved and having

the specific dimensions shown in figure 56.01-10 (e) for Test No. 6.

(f) (1) Tube specimens for Test No. 3 shall remain tight when subjected to a hydrostatic test pressure necessary to impose a hoop stress of 30,000 p. s. i. as calculated by the following formula:

$$P = \frac{2ST}{D} \quad (4)$$

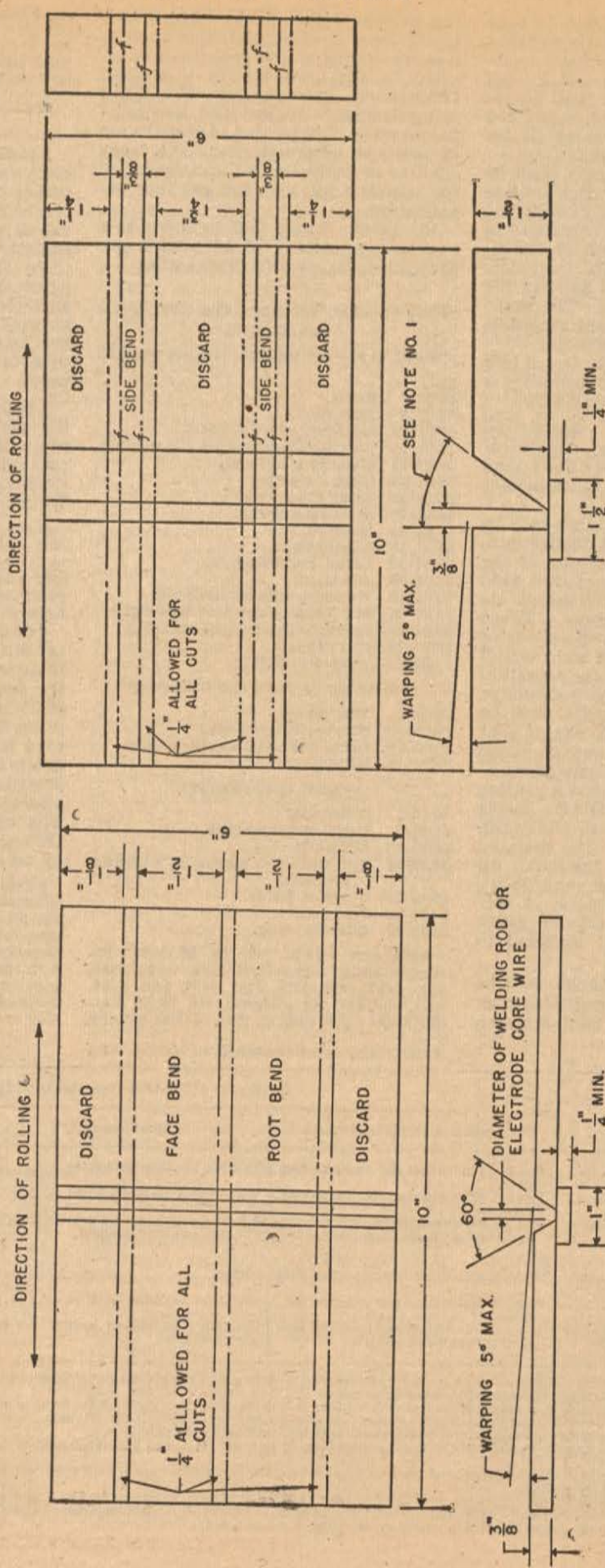
where:

P = required hydrostatic test pressure, in pounds per square inch.

S = 30,000 pounds per square inch.

T = wall thickness of the tube, in inches (not to exceed 0.120 inch).

D = inside diameter of the tube, in inches.



1. Arc welds shall be made with the maximum size of electrodes to be used in production. Gas welds shall be made with 3/8 inch diameter welding rods.
2. Machine reinforcement and backing strap flush. Do not remove any undercutting.
3. Machining shall be done transverse to weld.
4. All specimens shall be machined or sawed from plate.
5. Backing strap shall be contiguous with plates.
6. Arc welds made in the vertical position shall be welded upwards.
7. Welding shall be done from one side only.
8. Round edges of specimens to a radius of $\frac{7}{6}$ maximum.

FIGURE 56.01-10 (d1)—Welder's qualification Test No. 1.

1. When welding in the flat and vertical positions of welding the groove angle shall be 25°; when welding in the horizontal position the groove angle shall be 35° and the unbeveled plate shall be located on the top side of the joint.
2. Backing strap shall be contiguous with plates.
3. Each pass of the weld shall be made with the same size of welding rod or electrode to be used in production.
4. Arc welds made in the vertical position shall be welded upwards.
5. Welding shall be done from one side only.
6. Machine reinforcement and backing strap flush. Do not remove any undercutting.
7. All specimens shall be machined or sawed from plate.
8. Machining shall be done transverse to weld.
9. Round edges of specimens to a radius of $\frac{7}{6}$ maximum.

FIGURE 56.01-10 (d2)—Welder's qualification Test No. 2.

lowed by slow cooling in the furnace to a temperature below 500° F. Stress relieving, as outlined for Test No. 2 above, may be done on Test No. 4, provided such procedure is being used in production work.

(l) Test Nos. 1, 2, 3, 4, and 6 are applicable for either arc welders or gas welders. Test No. 5 is for arc welders only.

For arc welding, the passing of these tests with direct-current equipment shall qualify the welder for using direct-current equipment only and the passing of these tests with alternating-current equipment shall qualify the welder for using alternating-current equipment only. Passing

temperature is used in the actual fabrication. The temperature of the previously deposited weld metal shall not exceed 212° F. when subsequent beads or layers are deposited.

(j) No peening shall be done in Test Nos. 1, 3, 4, 5, and 6. Peening may be done on each layer in Test No. 2 except the first and last layers.

(k) No stress relieving shall be done on Test Nos. 1, 3, 5, and 6. On Test No. 2, before machining specimens from the joint, the plate shall be stress-relieved by maintaining it at 1150° F. ($\pm 50^\circ$ F.) for one hour per inch of thickness fol-

lowed by slow cooling in the furnace to a temperature below 500° F. Stress relieving, as outlined for Test No. 2 above, may be done on Test No. 4, provided such procedure is being used in production work.

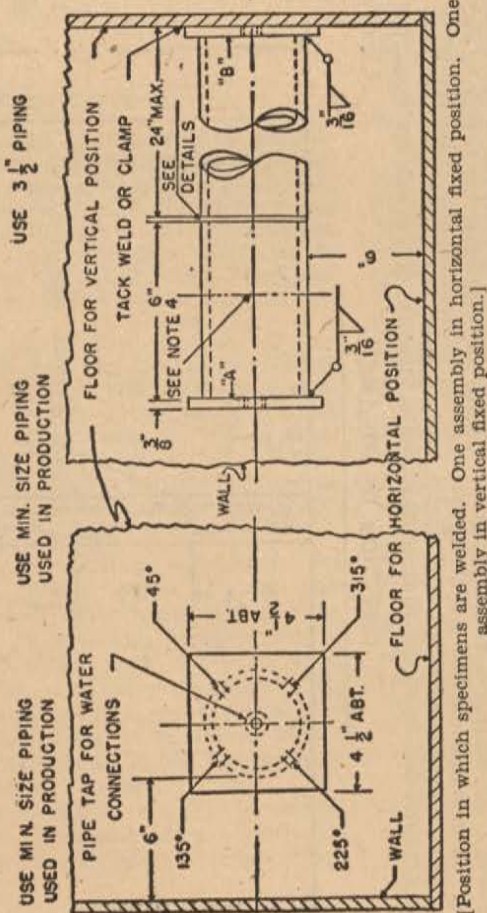
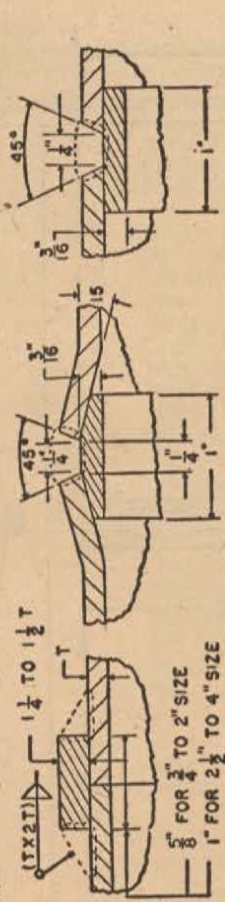
(l) Test Nos. 1, 2, 3, 4, and 6 are applicable for either arc welders or gas welders. Test No. 5 is for arc welders only.

For arc welding, the passing of these tests with direct-current equipment shall qualify the welder for using direct-current equipment only and the passing of these tests with alternating-current equipment shall qualify the welder for using alternating-current equipment only. Passing

temperature is used in the actual fabrication. The temperature of the previously deposited weld metal shall not exceed 212° F. when subsequent beads or layers are deposited.

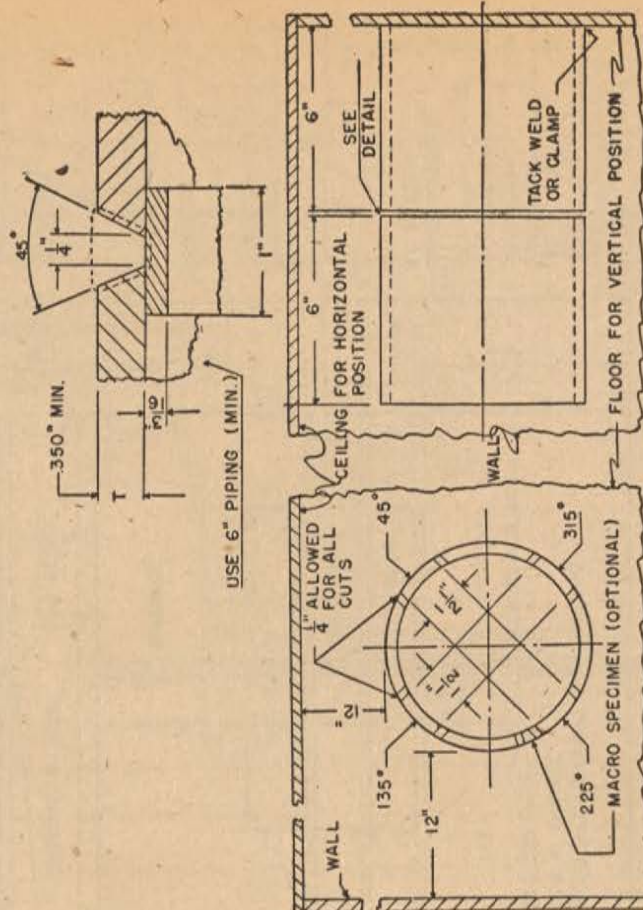
(j) No peening shall be done in Test Nos. 1, 3, 4, 5, and 6. Peening may be done on each layer in Test No. 2 except the first and last layers.

(k) No stress relieving shall be done on Test Nos. 1, 3, 5, and 6. On Test No. 2, before machining specimens from the joint, the plate shall be stress-relieved by maintaining it at 1150° F. ($\pm 50^\circ$ F.) for one hour per inch of thickness fol-



1. When slip-on sleeves and plain type backing rings are used in production, plain type backing rings shall be used in this test. When all three types are used in production, flare-type backing rings shall be used in this test.
2. Parts shall be galvanized where required.
3. Weld shall be deposited in a minimum of two layers.
4. Saw cut after pressure test for visual inspection.
5. No icicles or reduction of area of piping shall be permitted.
6. Omit end plates "A" and "B" when etch test is used in lieu of hydrostatic test.
7. Remove macro specimens from 45°, 135°, 225° and 315° points of the welded butt joints as indicated. (For etch test only.)
8. Mark top and front of piping to insure proper location of specimens when etch test is used in lieu of hydrostatic test.
9. Welding shall be done from one side only.
10. For arc welding use the maximum size of electrode to be used in production. For gas welding use 1/8 inch diameter welding rod.

FIGURE 56.01-10 (d3)—Welder's qualification Test No. 3.



[Position in which specimens are welded. One assembly in horizontal fixed position. One assembly in vertical fixed position.]

1. Each pass of the weld shall be made with the same size of welding rod or electrode that will be used in production.
2. Machine reinforcement and backing strap flush. Do not remove any undercutting.
3. Machining shall be done transverse to weld.
4. All specimens shall be machined or sawed from piping.
5. Round edges of bend specimens to a radius of $\frac{7}{8}$ maximum.
6. Mark top and front of piping to insure proper location of specimens.
7. Remove face-bend specimens from 45° and 225° points and root-bend specimens from 135° and 315° points as indicated.
8. Welding shall be done from one side only.
9. If piping of greater wall thickness than 0.380 inch is used in this test, piping may be machined to 0.350 inch to 0.380 inch before welding, or the bending jig may be made in accordance with the actual thickness T of piping used.

FIGURE 56.01-10 (d4)—Welder's qualification Test No. 4.

of these tests with direct-current equipment using either straight polarity or reversed polarity shall qualify the welder for both polarities.

(m) Results of qualification tests shall be maintained in typewritten form or by ink on a record card, the face and back of which are shown in figure 56.01-10 (m). A copy shall be furnished to the person or company qualifying the welder and shall be available for examination by the inspector.

§ 56.01-15 Automatic submerged arc welding. (a) Manufacturers desiring to use the automatic submerged arc welding process shall conduct a special process approval test to insure that he has

proper equipment, trained personnel, and is utilizing correct procedure to produce acceptable welds.

(b) The deposited weld metal may be laid in single or multiple passes. The design of the joint, amperage, voltage, speed of welding, size of welding rod, and grade of melt shall be in accordance with the recommendations of the welding equipment manufacturer, and the procedure used in qualifying shall be employed in fabrication.

(c) Manufacturers desiring to secure process approval in order to fabricate boilers and other pressure vessels by use of the submerged arc welding process shall prepare test plates in the presence of an inspector who will stamp the plates

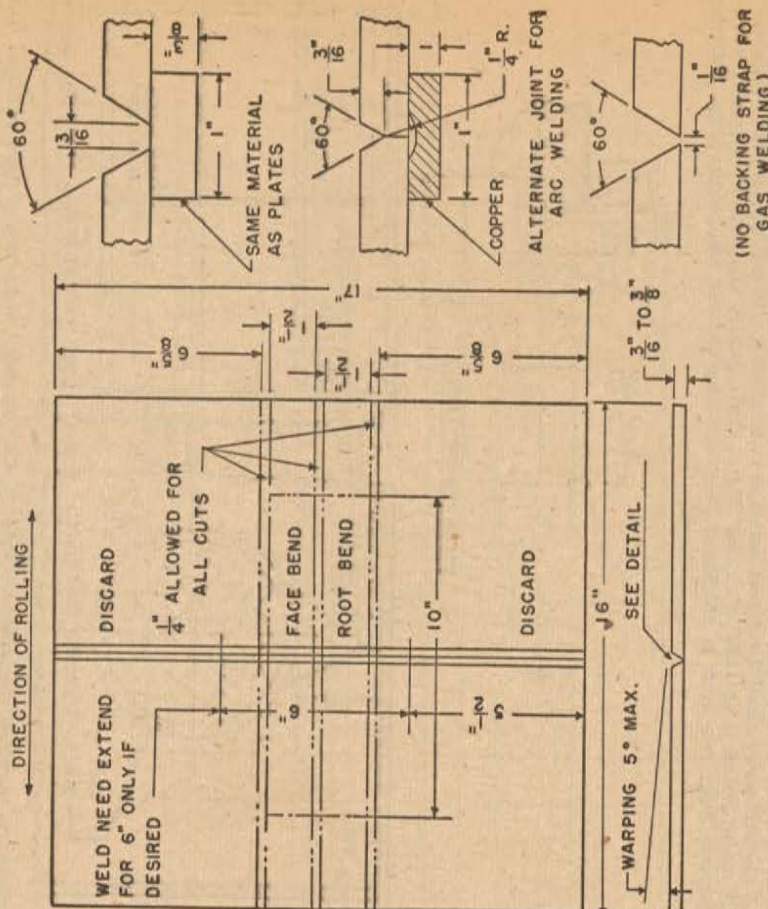
with the official stamp of the Coast Guard. One reduced section, guided side bend, free face bend, free root bend and two macro-etch specimens shall be machined from the test plates.

(d) The test plate material shall be of steel or firebox quality complying with the test plate material specified in Part 51 of this subchapter and which the manufacturer intends to use in fabrication. The thickness of the test plate material shall be an average thickness of the plate to be fabricated.

(e) Specimens may be tested at the manufacturer's laboratory or at a test-

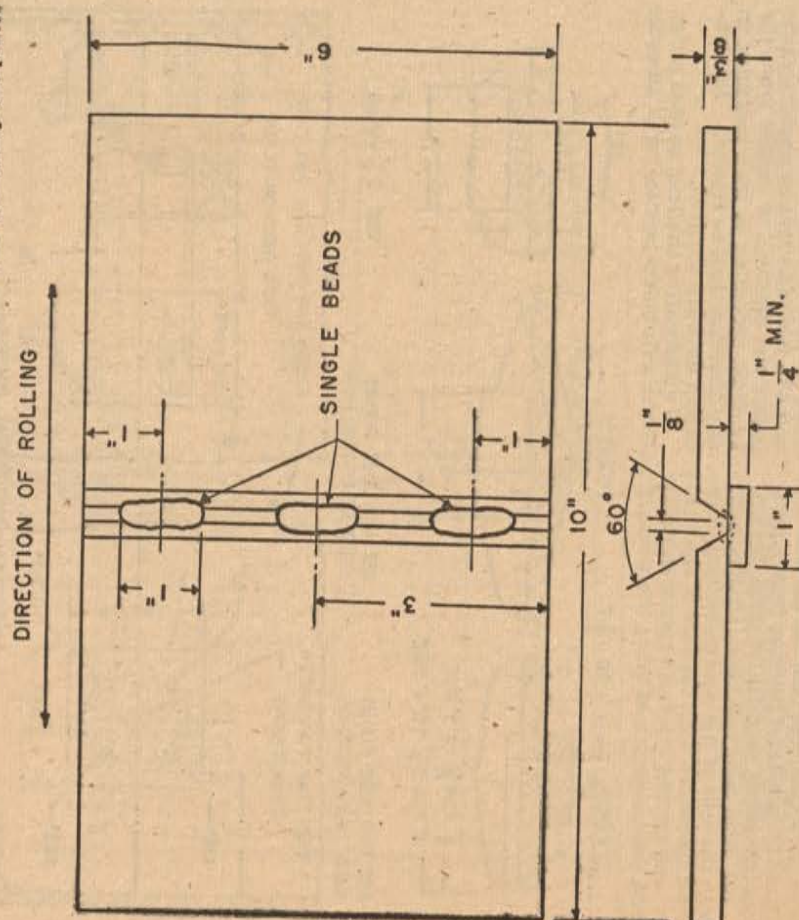
ing laboratory acceptable to the Com-mandant. Specimens shall be tested and meet the requirements of § 56.05-1 and the tests shall be witnessed by an inspec-tor. One retest will be permitted for each of the test specimens failing to meet the requirements. Should the retest fail, the manufacturer shall secure the serv-ices of an engineer from the manu-facturer of the welding equipment to check the same and give further instruction to the operator prior to the preparation of an additional set of test plates.

(f) Results of the physical tests, together with etch specimens shall be for-



1. Weld shall be made on the maximum thickness plate, within limits indicated, with maximum size welding rod or electrode to be used in production.
2. For gas welding machine reinforcement on both sides flush. For arc welding machine reinforcement and backing strap flush. Do not remove any undercutting.
3. Machining shall be done transverse to weld.

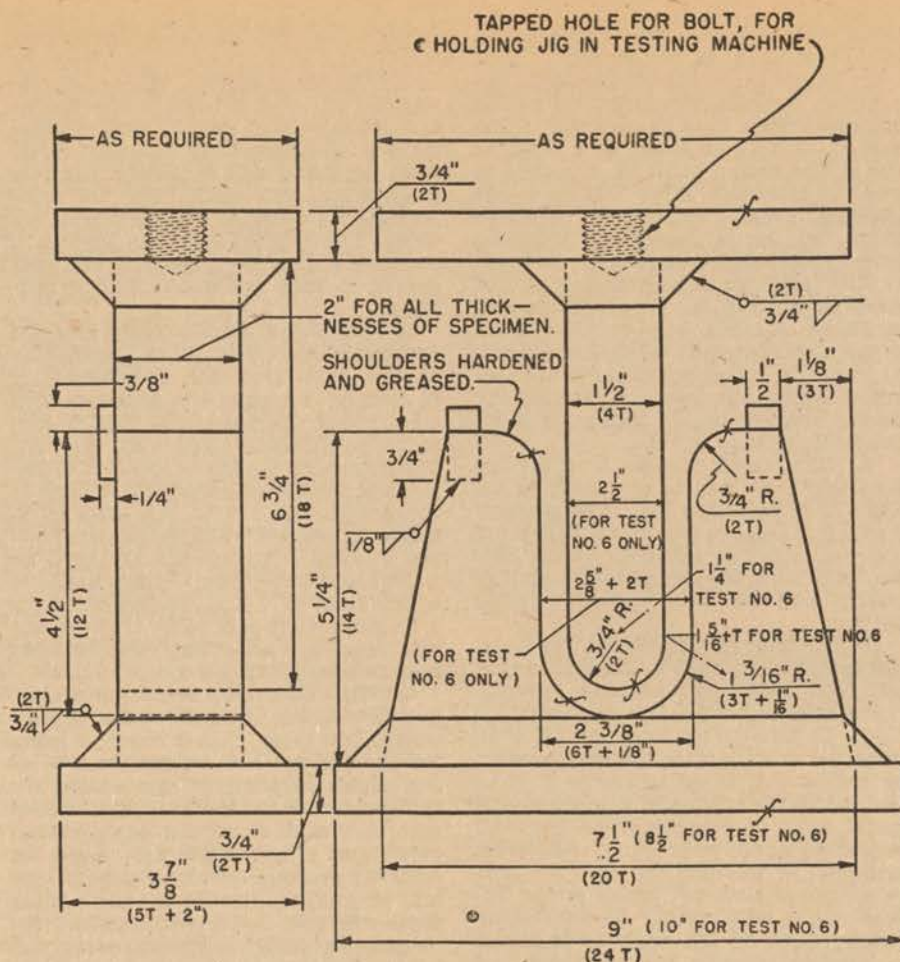
4. All specimens shall be machined or sawed from plates.
5. Backing strap shall be contiguous with plates.
6. Arc welds in the vertical position shall be welded upwards.
7. Welding shall be done from one side only.
8. Round edges of specimens to a radius of $\frac{7}{16}$ maximum.



1. $\frac{1}{8}$ inch diameter electrode shall be used.
2. Backing strap shall be contiguous with plates.
3. All welds in the vertical position shall be welded upwards.
4. Specimens shall be bent in one piece with backing strap in place and face of weld in tension.
5. Weld fractures shall exhibit no unfused areas on backing strap or sides of groove throughout length of each tack.

FIGURE 56.01-10 (d5)—Welder's qualification Test No. 5.

FIGURE 56.01-10 (d6)—Welder's qualification Test No. 6.



1. T = thickness of test specimens.
2. Specific dimensions are for 3/8-inch test specimens.
3. Hardened rolls may be used on shoulders if desired.

FIGURE 56.01-10 (e)—Standard qualification test bending jig.

RECORD CARD OF WELDER'S QUALIFICATION TESTS

Name.....
Employer.....
Approved for.....

Test No.	Process	Base metal	Positions	Diam. of electrode	Date of test	Signature of Inspector	Agency

[Face of card]

Date of birth.....
Place of birth.....
Symbol for marking work.....
Employed as a welder under—

Test No.	From—	To—

(Photograph)

Welder's signature.....

[Back of card]

FIGURE 56.01-10 (m)—Record card of welder's qualification tests.

TAPPED HOLE FOR BOLT, FOR
HOLDING JIG IN TESTING MACHINE

§ 56.01-25 *Class I welding.* (a) This class includes the construction of all pressure parts of power boilers, namely boilers operating in excess of 30 pounds per square inch, and unfired pressure vessels which the regulations do not permit to be fabricated by class II or class III welding.

(b) Longitudinal and circumferential joints shall comply with the requirements of § 56.01-55. The edge preparation of the weld test plates shall be of the same type to be employed in the fabrication.

(c) The joint efficiency *E* for this class shall be taken as 0.90.

§ 56.01-30 *Class II welding.* (a) This class includes the fabrication of heating boilers and unfired pressure vessels fabricated of material not exceeding 1½ inches in thickness which may contain any of the following:

(1) Vapors and gases at pressures not exceeding 600 p. s. i. and/or temperatures not exceeding 700° F. and liquids at temperatures not exceeding 400° F. (This pressure limitation does not apply to vessels subject to hydrostatic pressure operating only at atmospheric temperature. The limitation of plate thickness does not apply to heads formed of a single plate.)

(2) Stored or stowed dangerous substances which Parts 146 and 147 (Subchapter N—Explosives or Other Dangerous Articles or Substances, and Combustible Liquids on Board Vessels) of this chapter do not require to be carried in unfired pressure vessels fabricated by class I welding.

(b) Longitudinal and circumferential joints shall comply with the requirements of § 56.01-55. The edge preparation of the weld test plates shall be of the same type employed in the fabrication.

(c) The joint efficiency *E* of this class shall be taken as 0.80.

§ 56.01-35 *Class III welding.* (a) This class includes the fabrication of unfired pressure vessels fabricated of material not exceeding ¾ inch in thickness which may contain vapors and gases at pressures not exceeding 30 p. s. i. and liquids at pressures not exceeding 200 p. s. i. and/or temperatures not exceeding 250° F. Vessels fabricated by class III welding shall not be used for the storage or stowage of lethal gases or liquids.

(b) Longitudinal and circumferential joints shall comply with § 56.01-55. Lap joints as provided for by § 56.01-55 shall not be used in the fabrication of unfired pressure vessels used for the storage or stowage of any liquid at a temperature exceeding its boiling point at atmospheric pressure.

(c) The joint efficiency *E* of this class shall be taken as 0.65 for joints of the double-welded butt type where the plate thickness is not less than ¼ inch, and 0.55 for joints of the single-welded butt or welded lap types.

§ 56.01-40 *Material.* (a) Ferrous and nonferrous material for use in fabrication of shells and heads of welded pressure vessels shall comply with the grades of material specified in part 51 of this subchapter as suitable for arc or gas welding.

warded to the Commandant for consideration and action prior to the manufacturer using the equipment for production.

(g) The etch specimen shall be etched with a reagent which will clearly define the weld grain structure. After etching the specimens shall be rinsed, dried, and given a protective coating to prevent oxidation.

(h) A sketch shall be prepared and forwarded with the specimens showing joint preparation, and information relative to amperage, voltage, speed of welding, size, designation, manufacturer of welding rod, and grade of melt. Similar information shall be furnished if manual welding is employed on one side of the joint.

§ 56.01-20 *Welding electrodes.* (a) Pressure vessels, piping, valves, pipe fittings, and other pressure-containing appurtenances, subject to inspection by the Coast Guard, shall be fabricated by the use of acceptable electrodes. The list of manufacturers and types of electrodes acceptable to the Coast Guard may be obtained from the Commandant (MMT) upon request.

(b) Type E6012 or E6013 electrodes shall not be used in the fabrication of any item listed in paragraph (a) of this section.

(b) Wrought, cast, or forged materials shall be of good weldable quality having a carbon content not exceeding 0.35 percent and other chemical elements affecting weldability shall not exceed a percentage which may cause fabrication difficulty.

§ 56.01-45 *Calculations.* (a) The minimum thickness and maximum allowable pressure for shells of welded pressure vessels shall be determined by § 52.05-10 of this subchapter.

(b) The minimum thickness and maximum allowable pressure for heads of welded pressure vessels shall be determined by § 52.20-10 of this subchapter.

(c) The minimum thickness and maximum allowable pressure for welded piping shall be determined by § 55.07-5 of this subchapter.

§ 56.01-50 *Detail requirements.* (a) The surfaces of parts to be welded shall be cleaned of scale, rust, and grease at least $\frac{1}{2}$ inch from the welding edge. Grease or oil may be removed by a non-hazardous solvent. A wire brush may be used to remove light corrosion or mill scale. Heavy mill scale, slag, etc., shall be removed by chisel, air hammer, or other suitable tool to secure clean metal. (Discoloration resulting from flame cutting is not considered detrimental oxidation.) When it is necessary to deposit metal over a previously welded surface any scale or slag existing thereon shall be removed by a suitable means to prevent the inclusion of heterogeneous matter in the weld metal.

(b) The members to be joined shall be accurately cut to size and form. In all cases the forming shall be done by pressure and not by blows, including the edges of the plates forming longitudinal joints of cylindrical shells.

(c) Precaution shall be taken in the preparation of joints in which fillet welds are used in order to secure fusion of the weld metal at root of the fillet. Care shall also be exercised in depositing the weld metal so as to secure satisfactory penetration.

(d) If the thickness of the flange of a head to be attached to a cylindrical shell by a butt joint exceeds the shell thickness by more than 25 percent (maximum $\frac{1}{4}$ inch), the flange thickness shall be reduced at the abutting edges as shown in figure 56.01-50 (d).



FIGURE 56.01-50 (d)—Tapered flange of welded head attachment.

(e) The edges of the plates at the joints shall not have an offset from each other at any point in excess of one-quarter of the plate thickness at the joint, with a maximum permissible offset of $\frac{1}{8}$ inch for longitudinal joints and $\frac{1}{4}$ inch for circumferential joints.

(f) Where plates of unequal thicknesses are abutted, the edge of the thicker plate shall be reduced so that it is approximately the same thickness of the thinner plate. The middle lines of plate thicknesses for longitudinal shell

joints shall be within the limits as given in paragraph (e) of this section.

(g) Except where specifically permitted in other sections, the design of welded pressure vessels shall be such that if the welded joint is subjected to a bending stress, the design shall be analysed so that the maximum stress will be within allowable limits. Complete penetration of the weld metal through the members joined shall be secured plus the addition of fillet welds where necessary to reduce stress concentration. Corner joints with members attached only by fillet welds where a concentrated bending stress will occur at the root of the weld are not permitted unless the members forming the corner are adequately supported independently of such welds.

(h) Bars, jacks, clamps, or other appropriate tools may be used to hold the edges to be welded in line. The edges of butt joints shall be held so that they will not overlap during welding. Where fillet welds are used, the lapped plates shall fit closely and be held together during welding.

(i) The joint preparation of the material to be welded shall be such as to permit good fusion and complete penetration where butt welds are employed.

(j) Double-welded butt joints shall have the reverse sides chipped, ground, or melted out, so as to secure a clean surface of the originally deposited weld metal, prior to depositing the first bead of welding on the reverse side. Chipping, grinding, or melting out shall be done in a manner that will insure proper fusion of the weld metal. The foregoing requirements do not apply to processes of welding whereby proper fusion and penetration are obtained and heterogeneous matter is eliminated from the root of the weld.

(k) If the welding is stopped for any reason, extra care shall be taken in restarting to secure complete penetration at the root of the weld and thorough fusion between the weld metal and the plates, and to the weld metal previously deposited.

(l) If single-welded butt joints are used, care shall be taken in aligning and separating the edges to be joined so that complete penetration and fusion at the root of the weld will be assured.

§ 56.01-55 *Joints.* (a) Longitudinal joints of class I and class II pressure vessels shall be of the double-welded butt type and a reinforcement of at least $\frac{1}{16}$ inch shall be provided on each face of the weld, except for plates of $\frac{1}{4}$ inch or less in thickness the reinforcement need not exceed 25 percent of the plate thickness. The reinforcement on either or both faces of the weld may be removed, but if not removed shall be free of grooves, valleys, or other change in

contour along the edge or upon the surface of the weld if the inspector deems such to be objectionable. When a single-welded butt joint is made the equivalent of a double-welded joint by using a backing bar and depositing the filler metal from only one side to secure complete penetration, the requirement for reinforcement applies only to the face of the weld. The backing bar may be left in place or it may be removed. The root gap of $\frac{3}{16}$ inch minimum shall be provided.

(b) The longitudinal joints of class III pressure vessels may be of the double-welded butt type for thicknesses of $\frac{5}{8}$ inch or less, or of the double-welded lap type for thickness of $\frac{3}{8}$ inch or less, or of the single-welded butt type for thicknesses of $\frac{1}{4}$ inch or less. If of the lap type the throat dimension of each of the welds shall not be less than $\frac{5}{8} T$, where T represents the thickness of the plate. Both edges of the lap shall be welded and the surface overlap shall not be less than $4T$. The reinforcement for a single-welded butt joint shall be not less than $\frac{1}{16}$ inch. The reinforcement may be removed if so desired.

(c) Circumferential joints for class I pressure vessels shall be of the double-welded butt type. Circumferential joints for class II pressure vessels shall be of the double-welded butt type except for thicknesses of $\frac{5}{8}$ inch or less, in which case they may be of the single-welded butt type. Circumferential joints on class III pressure vessels may be of the butt or lap type. The details of all joints shall conform to the requirements for longitudinal joints, as given in paragraph (a) of this section.

(d) Dished heads concave to the pressure when used on class III pressure vessels shall be inserted with a driving fit and fillet welded inside and outside, except that for vessels 20 inches in diameter or less the heads may be welded on the outside only. The welds shall be located on the flange of the head at a distance not less than twice the thickness of the head from the point of tangency of the knuckle and in no case less than $\frac{1}{2}$ inch. Dished heads concave to the pressure shall have a length of flange not less than 1 inch for shells not over 24 inches in diameter. For shells over 24 inches in diameter this length shall not be less than $1\frac{1}{2}$ inches.

(e) Dished heads convex to the pressure shall have a flange not less than $1\frac{1}{2}$ inches long except where the flange thickness is $\frac{3}{8}$ inch or under, in which case the flange need not be more than four times the thickness of the head. When heads are inserted into the shell, same shall be with a driving fit and welded as shown in figure 56.01-55 (e).

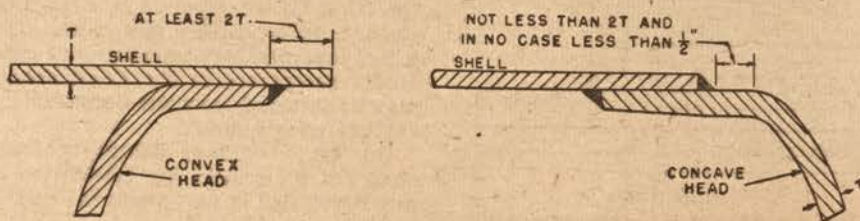


FIGURE 56.01-55 (e)—Details of circumferential joints of dished heads.

(f) Heads concave to the pressure and plates having circumferential joints to be attached by butt welds shall be aligned so that the deviations are not more than permitted by the limitations given in § 56.01-50, but if greater, correction shall be made by reforming the shell or head, whichever is out of true, until the errors are within the limits specified. The edges of head and circumferential joints shall be separated by a suitable root gap to insure complete penetration of the weld metal.

(g) Flat heads may be attached to pressure vessels in accordance with the requirements of § 52.20-10 of this subchapter.

(h) The welder's symbol shall be stamped on each pressure vessel adjacent to the weld and at intervals not to exceed 3 feet along the welds made manually or by machine. In lieu thereof, a permanent record may be kept by the manufacturer furnishing the name of the welder employed in making each joint, this record shall be made available to the inspector upon request.

§ 56.01-60 Welded nozzle connections.

(a) Material for nozzles may be of forged, wrought, or cast steel meeting the requirements of Part 51 of this subchapter.

(b) All welding for arc- or gas-welded connections shall be equivalent to that required for the particular class of vessel to which the connection is attached.

(c) Screwed connections are not permitted for diameters exceeding 2 inches and for pressures exceeding 150 p. s. i. Flanged connections shall meet the requirements of Part 55 of this subchapter.

(d) Some acceptable types of arc- or gas-welded nozzle and fitting attachments are shown in figure 52.25-20 (d).

§ 56.01-65 Seal welding and tack welding. (a) Seal welding may be used for the purpose of securing tightness of connections where the structure is such that no strain is placed upon the weld. Seal welding consists of depositing not more than two beads of weld metal. The throat of the weld shall not exceed $\frac{1}{4}$ inch and the size of the electrode employed shall not exceed $\frac{3}{16}$ inch diameter. Seal welds are not required to be stress-relieved.

(b) Tack welding may be used for attaching internal baffles, strainers, external lugs, securing lagging, etc., provided the welds do not have a throat exceeding $\frac{1}{4}$ inch, are not more than 2 inches in length and are spaced at least 2 inches apart. Tack welds are not required to be stress-relieved.

(c) Seal welding and tack welding shall be done by qualified welders using acceptable electrodes or welding rods (See § 56.01-20). Welding on vessels shall not be performed when the temperature of the drum is below 50° F.

§ 56.01-70 Preheating and stress relieving. (a) All pressure vessels required to be fabricated by class I welding unless specifically exempted in other parts of this subchapter shall be stress-relieved to dissipate the major portion of the residual stresses.

(b) Stress relieving shall be done by heating the weldment slowly and uni-

formly to a temperature of from 1,100° F. to 1,200° F. for carbon-steel and held at that temperature for a period of time proportioned on the basis of at least one hour per inch of thickness and allowed to remain in the furnace until 500° F. is reached at which time the weldment may be withdrawn and allowed to cool in a still atmosphere. When a weldment of various thicknesses of material is stress-relieved, the thickest section of the parts welded shall govern the length of time required for soaking. Pressure vessels fabricated of carbon-steel exceeding $\frac{1}{2}$ inch in thickness shall be preheated locally to 125° F., prior to welding, when the ambient temperature is below 50° F. Alloy materials usually require different stress-relieving temperatures due to different chemical properties of the material. The heat treatment covering preheating and stress relieving to be employed on the latter types of materials shall be in accordance with the recommendations of the manufacturer of the material and as specifically approved by the Commandant.

(c) When the vessel is required to be stress-relieved, all connections attached by arc or gas welding unless specifically exempted shall also be stress-relieved as required by this part.

(d) Local stress relieving of welds shall be performed by means of electrical inductance, electrical resistance, or other acceptable means whereby the temperature is accurately controlled. When a type of stress relief is used that produces direct radiation, the thermocouple shall be insulated so that the hot junction of the thermocouple will not be subject to the heat of radiation. Pyrometric equipment shall be provided to indicate the hottest and coolest points of the weldment. If the weldment is of appreciable size, the number of thermocouples provided shall be sufficient to insure complete coverage. The temperature of the weldment shall be considered as being the average of the observed temperature.

(e) The stress relieving operations shall be indicated by pyrometric equipment. When an autographic record of local stress-relieving operations is made, this record shall be maintained by the fabricator.

(f) The weldment shall be stress-relieved by one of the methods as follows:

(1) Heating the complete structure as a unit.

(2) Heating a section containing the part or parts to be stress-relieved.

(3) Circumferential joints may be stress-relieved by uniformly heating a circumferential band having a minimum width of six times the material thickness on each side of the welded joint in such a manner that the entire band is brought up to the required temperature and held for the period specified in paragraph (b) of this section.

(4) Where piping is welded to valves, the heated zone may be decreased on the valve side of the joint from six times the material thickness to one times the width of the reinforcing band measured from the edge of fusion toward the valve. This deduction in the area to be heated

is to prevent injury to the valve due to overheating.

(5) Nozzles or other welded attachments which are required to be stress-relieved may be locally stress-relieved by heating a circumferential band around the entire vessel with the connection at the middle of the band to the required temperature and length of time specified for stress relieving. The band width shall be a minimum of six times the shell thickness on each side of the attachment.

(g) Except where specifically allowed in other sections all nozzle connections after being attached by welding on vessels fabricated by class I welding shall be stress-relieved.

(h) Vessels fabricated by class II welding shall be stress-relieved if so required by figure 56.01-70 (h) or if fabricated of grade D, E, F, or G marine steel boiler plate of a thickness exceeding 1 inch. When vessels fabricated by class II welding are required to be stress-relieved, all nozzles or other welded attachments when joined by arc or gas welding shall be stress-relieved. When vessels fabricated by class II welding are not required to be stress-relieved, unreinforced nozzle connections and other attachments when joined by arc or gas welding are not required to be stress-relieved. When nozzles are reinforced with pads having a thickness greater than that of the shell or head to which they are attached, the nozzles shall be stress-relieved.

(i) Arc- or gas-welded connections may be added to class I and class II pressure vessels after they have been stress-relieved, without requiring stress-relief, provided:

(1) The diameter of the attachment opening in the vessel walls does not exceed that allowed for an unreinforced opening or does not exceed 2 inches, whichever is smaller; and,

(2) The inside and outside attachment welds do not exceed $\frac{3}{8}$ inch throat dimension. This provision does not apply to those connections so placed as to form ligaments in the shell, the efficiency of which will affect the shell thickness. Such added connections shall be stress-relieved.

(j) All connections attached by arc or gas welding to vessels fabricated by other means shall be stress-relieved in accordance with the requirements for connections on class II pressure vessels. If any such vessels are to be used for service equivalent to class I pressure vessels, arc- or gas-welded connections shall be stress-relieved.

(k) Arc- or gas-welded connections which require stress relieving and which are attached to vessels whose seams are of riveted construction shall be fabricated and stress-relieved prior to the making up or attachment of the courses by riveting. If they do not require stress relieving and are attached after riveting, the welds shall be located at a distance from the riveted seam at least equal to the diameter of the opening plus four times the plate thickness of the shell.

(l) All vessels containing lethal liquids or gases shall be stress-relieved. Any vessels containing liquids, gases or other

substances which Part 38 (Subchapter D—Tank Vessels) or Part 146 or 147 (Subchapter N—Explosives or Other Dangerous Articles or Substances and Combustible Liquids on Board Vessels) of this subchapter require to be fabricated by a class of welding requiring stress relief shall be stress-relieved.

(m) Cold weldments shall not be placed in the furnace when the temperature therein exceeds 500° F. Upon cooling the weldment may be removed from the furnace when the temperature of same has reached 500° F. and allowed to cool in still air to assure a gradual decrease in temperature.

§ 56.01-75 *Distortion*. Drums of welded or brazed pressure vessels shall be circular at any section within a limit of one percent of the mean diameter, based on the difference between the maximum and minimum mean diameter at any section. If necessary to meet the foregoing requirement, the drum shall be reheated, rerolled, or reformed. To determine the difference in diameters, measurements may be made on the inside or the outside, and when the drum is fabricated of plates of unequal thickness, the measurements shall be corrected for plate thicknesses to determine the diameter at the middle line of the plate thickness.

§ 56.01-80 *Welded piping*. (a) Piping materials complying with Part 51 of this

subchapter may be joined by means of arc or gas welding provided the fabrication complies with the requirements of this section.

(b) The requirements of this section are applicable to class I piping (see Part 55 of this subchapter) and class II piping unless specifically exempted.

(c) Prior to welding class I piping, the fabricator shall request an inspector to visit his plant to examine his fabricating equipment and to witness the qualification tests required by § 56.01-10. One test specimen shall be prepared for each process and welding position to be employed in the fabrication.

(d) Sections of pipe shall be welded insofar as possible in the fabricating shop. The type of weld shall be clearly indicated on the drawings.

(e) For class I piping, double-welded butt joints or single-welded butt joints fitted with a backing ring or its equivalent on the inside of the pipe shall be employed when the pipe diameter exceeds 2½ inches. Piping of diameters not exceeding 2½ inches may be joined by sleeves fitted over the ends of the pipes, or socket joints attaching the ends of the pipes by means of circumferential fillet welds. If butt joints are employed for pipe diameters of 2½ inches and below the backing ring may be omitted in diameters below 1 inch.

(f) For class II piping, the type of joints shall be similar to class I piping, with the following exceptions:

(1) Single-welded butt joints may be employed without the use of backing rings in all sizes provided that the weld is chipped or ground flush on the root side of the weld.

(2) For services such as vents, overflows, and gravity drains, the backing ring may be eliminated and the root of the weld need not be ground.

(3) Square-groove welds without edge preparation may be employed for butt joints in vents, overflows, and gravity drains where the pipe wall thickness does not exceed ⅜ inch.

(g) The backing ring for class I piping shall be of low-carbon steel and shall be of the plain type or a type with projections spaced intermittently around the outside of the periphery to establish a minimum root gap of not less than ⅛ inch for 1-inch to 2-inch diameter and ⅜ inch for 2½-inch and larger diameter pipes to secure complete penetration of the weld metal. The crimped or forged types with continuous projection around the outside of the ring is acceptable only for class II piping.

(h) All butt welds shall be reinforced at the center of the weld by not less than 10 percent of the wall thickness for pipe or tubes for thicknesses not exceeding ⅝ inch; pipes and tubes having a wall thickness exceeding ⅝ inch shall be reinforced by at least ⅜ inch. The reinforcement shall be free of grooves, valleys, or other changes in contour along the edge or upon the surface of the weld if the inspector deems such to be objectionable.

(i) Each butt-welded joint shall be stamped with the welder's identification symbol.

(j) Welded class I piping or tubing exceeding 2½ inches in diameter with the exception of high pressure salt water piping systems used in tank cleaning operations shall be stress-relieved as required by § 56.01-70. Stress relief for class II piping is not required.

(k) All complicated connections including manifolds, shall be stress-relieved in a furnace as a whole as required by § 56.01-70 before being taken aboard ship for installation.

(l) Class I carbon-steel and alloy-steel piping exceeding 2½ inches in diameter shall be preheated as required by § 56.01-70.

(m) (1) All welded joints on class I piping exceeding 2½ inches nominal pipe size, with the exception of high pressure salt water piping systems used in tank cleaning operations, shall be nondestructively tested as required by § 56.05-5.

(2) All welds shall be free of grooves and depressions. Surfaces of welded joints which are to be magnetic powder tested shall be made smooth of all surface irregularities so that the powder may properly indicate any fracture or defect.

(n) For hydrostatic tests of welded piping, see § 55.07-30 of this subchapter.

(o) The base material and joint preparation for welding shall comply with the manufacturer's process record.

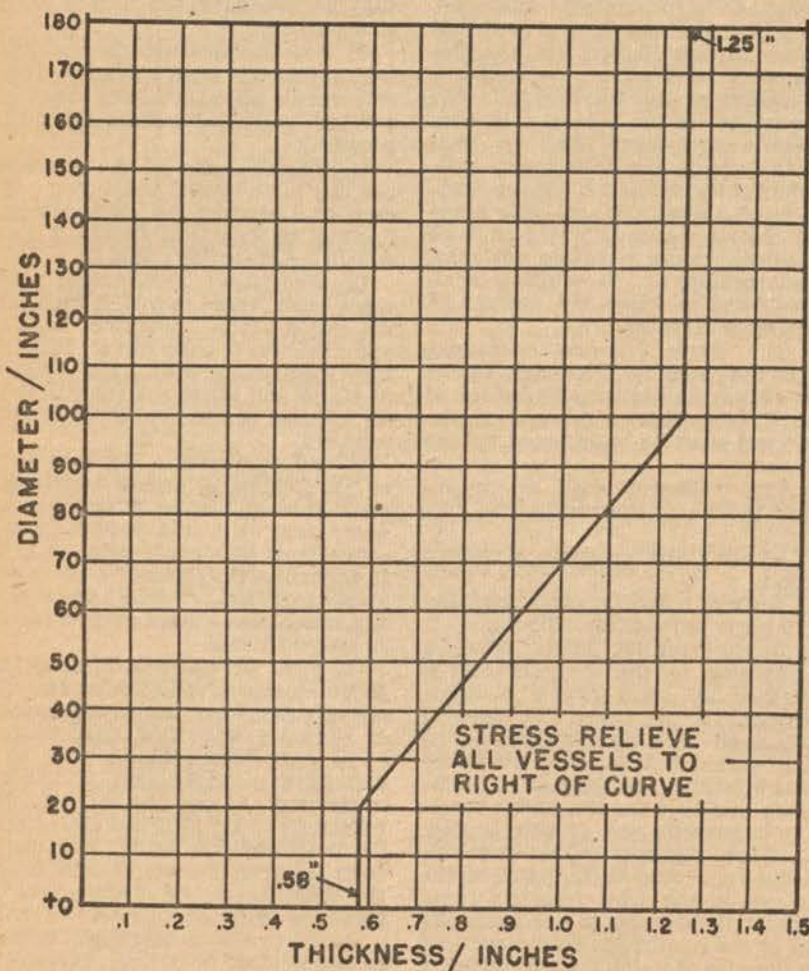


FIGURE 56.01-70 (h)—Stress relief diagram for class II pressure vessels.

(p) A complete record of the manufacturer's process shall be maintained on the form shown by figure 56.01-80 (p) to establish definite limits of all essential variables involved. The manufacturer shall, after his welding process has been approved, conduct all welding in accordance with the requirements of his process record.

SUBPART 56.05—TESTS AND INSPECTION

§ 56.05-1 *Test plates.* (a) Test plates shall be provided for class I and class II pressure vessels as hereinafter specified in this section.

(b) A test plate of the same grade and thickness as the shell plate being welded shall be attached to the shell plate on one end of the drum as shown in figure 56.05-1 (b) so that the edges of the test plate to be welded are a continuation and duplication of the corresponding edges of the longitudinal joint. The weld metal shall be deposited in the test plate welding groove continuously with the weld metal deposited in the groove of the longitudinal joint. The test plate material may be taken from any part of one or more plates of the same heat from which the plates were rolled that was used in the fabrication of the welded pressure vessels. The manufacturer shall provide suitable marking to indicate for which vessels the test plate is representative of the welding.

(c) When a test plate is attached to the shell and welded continuously with the longitudinal joint, none is required for the circumferential joints or nozzles of the same drum, providing the welding process, procedure, and technique are the same. When a drum has only circumferential joints, a test plate of the same material as that from which the shell was fabricated shall be welded in the same way as the joints in question.

(d) No test plates are required for nozzles when the drum has neither longitudinal nor circumferential welded joints.

(e) Drums fabricated of carbon-steel plate having circumferential joints but no longitudinal joints shall have at least one set of test plates welded separately for each drum or for each 50 feet of aggregate circumferential joints of drums of the same grade of material being welded in succession whose plate thicknesses fall within a range of $\frac{1}{4}$ inch, and whose diameters vary by not more than 6 inches.

(f) (1) When several class I pressure vessels fabricated of carbon-steel plate are being welded in succession or at any one time, the plate thicknesses of which fall within a range of $\frac{1}{4}$ inch, each 50 lineal feet of longitudinal and circumferential joints may be considered as the equivalent of one vessel for which test plates required by paragraph (a) or (b) of this section shall be furnished. Drums fabricated of carbon molybdenum grade E, F, or G marine boiler steel plate shall be welded separately and at least one set of test plates as required by paragraph (a) or (b) shall be furnished for each drum.

(2) For class II pressure vessels no more than one set of test plates need be provided for each 300 lineal feet of either

or both longitudinal and circumferential joints.

(g) The test plates shall be welded by the same welder or welders employed on the drums. They shall be of the same thickness as the plates being welded and shall be of sufficient size to provide two

specimens of each type required except that in the case of drums having no longitudinal seams, the test plates need be long enough to provide only one set of specimens and in the case retests are required, an additional set of plates may be welded separately.

CONTRACTOR'S NAME _____							
ADDRESS _____							
PROCESS _____				DATE _____			
MATERIAL (BASE METAL _____)							
MATERIAL (FILLER METAL _____)							
For Gas Welding Type of Flame _____				For Arc Welding Type of Current _____			
If D. C., state polarity. _____							
IDENTIFICATION SYMBOLS OF THIS WELD							
In above space indicate edge preparation and relative position of each pass as deposited.	PASS NUMBER	HEAT	INPUT	DATA	DIAM. OF FILLER METAL	TEMP. DEG. F.	REMARKS
*Give degree of preheat, if any. Indicate temperature of weld metal just prior to the deposition of each succeeding pass.							
Cleaning of Passes _____							
Treatment of Defects _____							
Peening _____							
Heat Treatment (Temp. _____ Time _____ Cooling _____)				Name of welder _____ Name of Recorder _____			

FIGURE 56.01-80 (p)—Manufacturer's record of welding process.

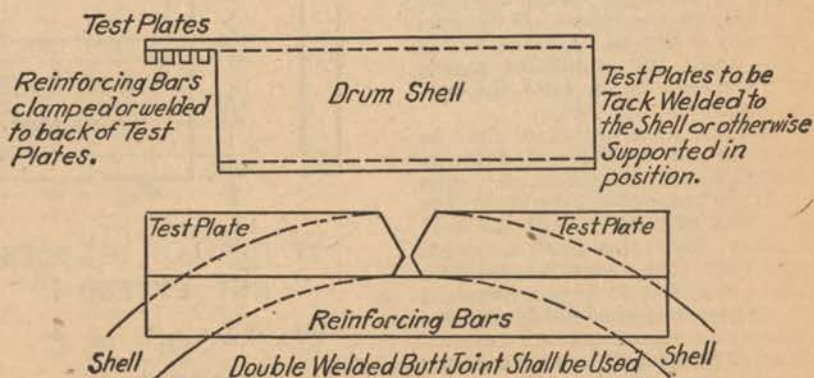


FIGURE 56.05-1 (b)—Method of forming longitudinal test plates.

RULES AND REGULATIONS

(h) For test plates $\frac{3}{4}$ inch or less in thickness, one reduced-section tensile specimen and two free-bend specimens shall be tested. For plates exceeding $\frac{3}{4}$ inch in thickness, one reduced-section tensile specimen, one free-bend specimen and one guided side-bend specimen shall be tested.

(i) The test plates shall be so supported that the warping due to welding shall not throw the finished test plate out of line by an angle of over 5° .

(j) Where the welding has warped the test plates, the plates shall be straightened before being stress-relieved. The test plates shall be subjected to the same stress-relieving operation as required by § 56.01-70. At no time shall the test plates be heated to a temperature higher than that used for stress relieving the vessel.

(k) The bend specimens shall be taken from opposite sides of the reduced section tensile specimen in their respective test plates as shown in figures 56.05-1 (k1) and 56.05-1 (k2).

(l) In submitting the samples for test the manufacturer shall state the minimum and maximum tensile range of the base metal. If this information is not available, he shall submit a test coupon of the solid plate machined to form as shown in figure 51.04-35 (d).

(m) The external appearances of the welds and the amount of weld reinforcement shall conform to the requirements for fabrication, and the maximum reinforcement for the test plates shall not exceed the maximum permitted for construction.

(n) The tension-test specimen shall be transverse to the welded joint and shall be the full thickness of the plate after the weld reinforcement has been machined flush. The form and dimensions shall be as shown in figure 56.05-1 (n1). When the capacity of the available testing machine does not permit testing a specimen of the full thickness of the plate, the specimen may be cut with a thin saw into as many portions of the thickness as are necessary, as shown in figure 56.05-1 (n2), each of which shall meet the requirements. The tensile strength shall not be less than the minimum of the specified tensile range of the plate used. In the event of a failure of the base metal, rather than the weld metal, below the minimum tensile strength specified for the plate, a tension-test specimen of all weld metal machined to form as shown in figure 56.05-1 (n3), may be tested. If the tensile strength of this all weld specimen is not less than the minimum tensile strength specified for the plate, the weld will be considered acceptable.

(o) The free bend specimens shall be of the form and dimensions shown in figure 56.05-1 (o). For plates of $\frac{3}{4}$ inch or less in thickness one of the specimens shall be bent with the face of the weld in tension. Each free bend specimen shall be bent cold under free-bending conditions until the elongation measured within or across approximately the entire weld on the outer surface of the bend is at least 30 percent. When the capacity of the available testing machine will not permit testing a full thickness specimen, the specimen may be cut with a thin saw

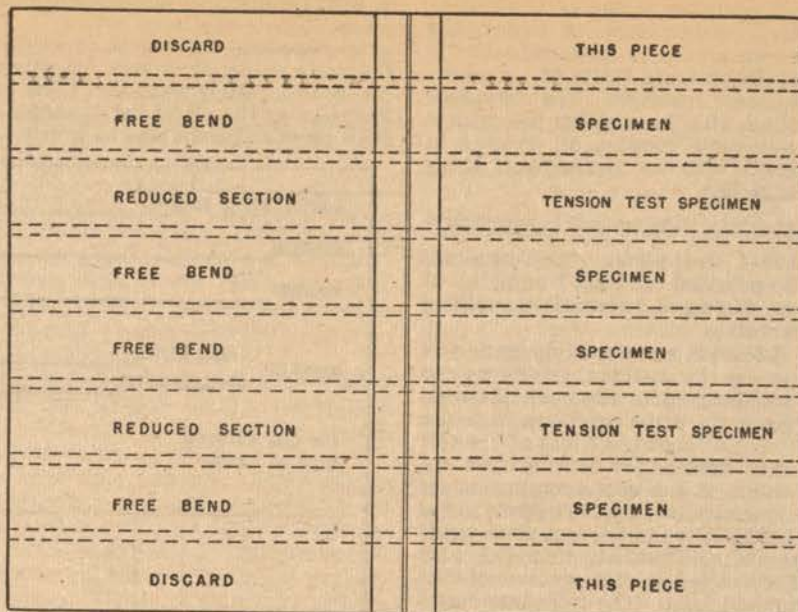


FIGURE 56.05-1 (k1)—Test plates for material $\frac{3}{4}$ inch or less in thickness.

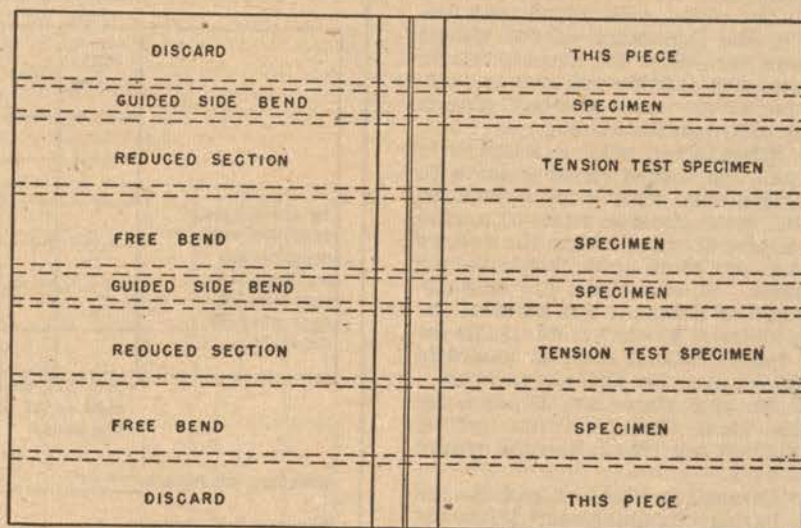


FIGURE 56.05-1 (k2)—Test plates for material over $\frac{3}{4}$ inch in thickness.

WELD REINFORCEMENT SHALL BE MACHINED
FLUSH WITH BASE METAL

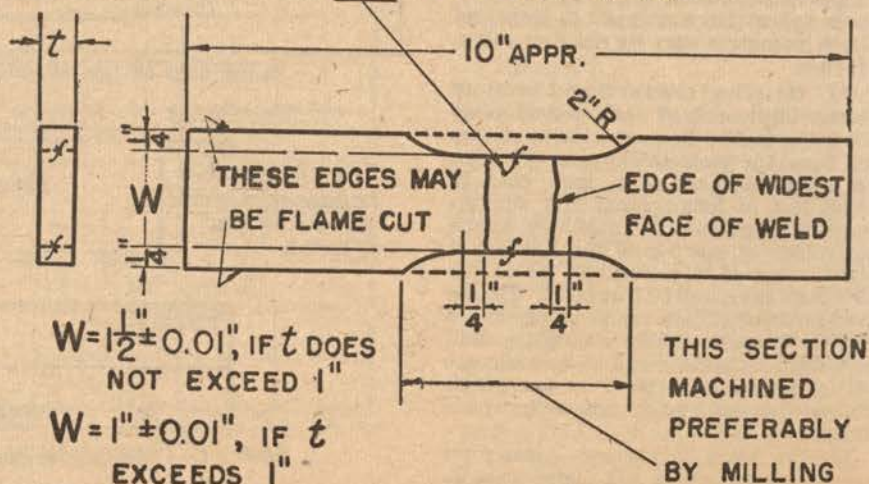


FIGURE 56.05-1 (n1)—Reduced-section test specimen required for tension test of welded joint.

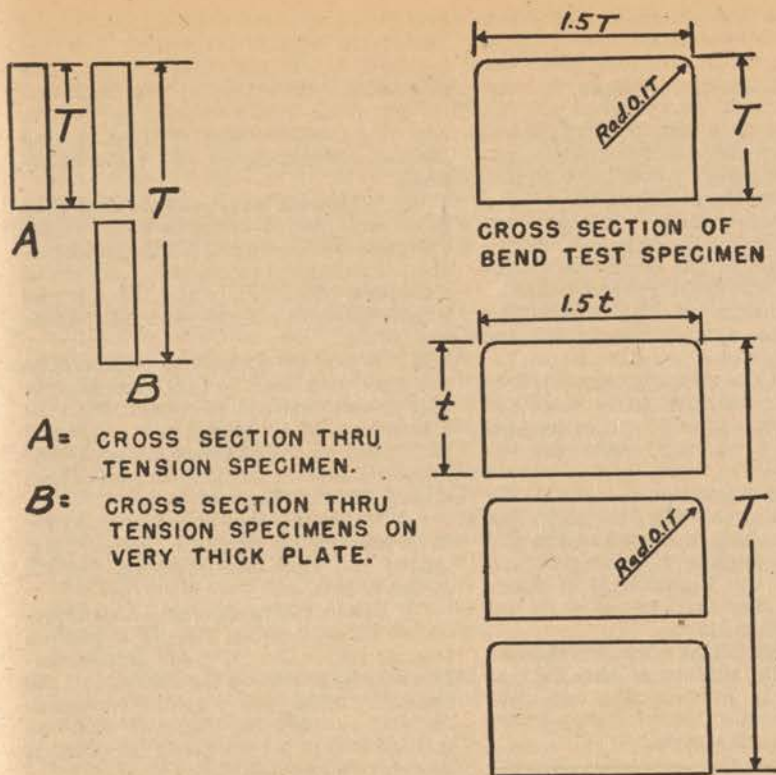


FIGURE 56.05-1 (n2)—Cross section of bend-test specimens from very thick plate.

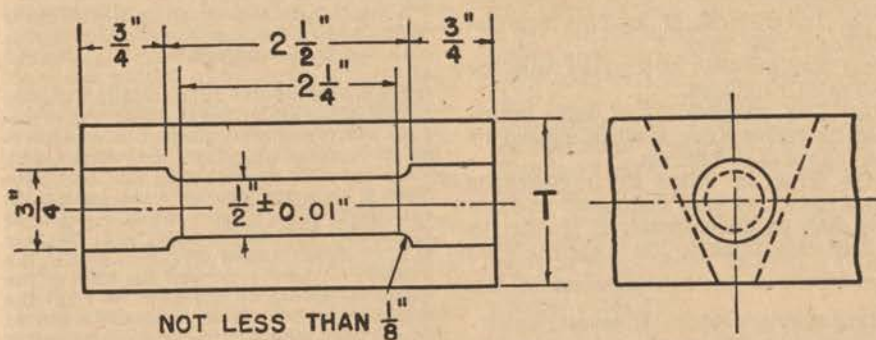


FIGURE 56.05-1 (n3)—All weld metal tension-test specimen.

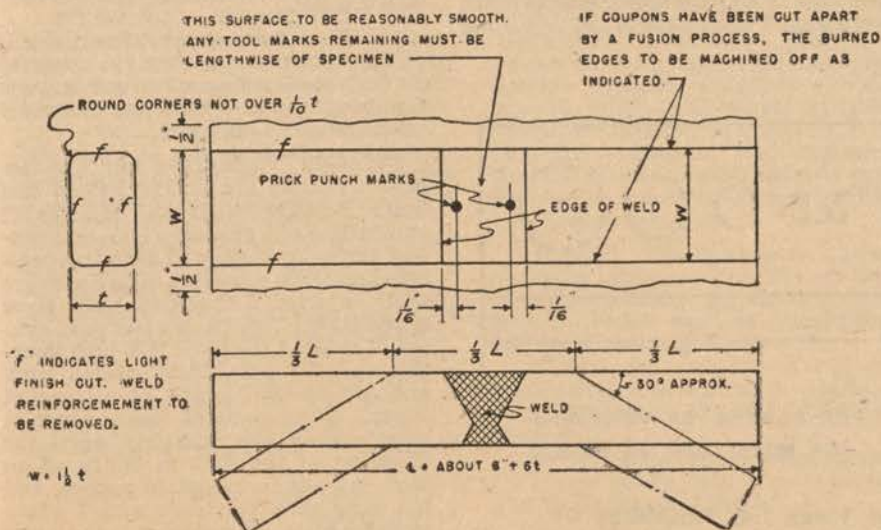


FIGURE 56.05-1 (o)—Specimen for free-bend test.

into as many portions of the thickness as necessary, as shown in figure 56.05-1 (n2), provided each such piece retains the proportion of $1\frac{1}{2}$ to 1, width to thickness, each of which shall meet the requirements. Cracks at the corners of the specimens or small defects in the convex surface, the greatest dimensions of which do not exceed $\frac{1}{8}$ inch need not be considered as failures. For class II pressure vessels, the minimum elongation for the free bend specimen shall be 20 percent.

(p) The guided bend specimen shall be bent with the side of the weld in tension. Its width shall be equal to the full thickness of the plate and its thickness, after machining shall be 0.350 inch to 0.380 inch to permit bending in a jig having the contour of the standard jig as shown in figure 56.01-10 (e). The specimen shall withstand being bent cold to the full capacity of the jig without developing any crack exceeding $\frac{1}{8}$ inch in any direction. Where the plate thickness exceeds 2 inches, the specimen shall be cut in two so that each portion does not exceed 2 inches in width. Each such portion shall be tested and shall meet the requirements.

(q) One retest shall be made for each of the original specimens which fails to meet the requirements. Should the retests fail to meet the requirements, the welds which they represent shall be chipped out, rewelded and new test plates provided. This shall apply to each shell in cases where a number of shells of the same design and grade of material are placed end to end and the longitudinal seams are welded continuously.

§ 56.05-5 *Nondestructive tests.* (a) All longitudinal and circumferential arc- or gas-welded butt joints of pressure vessels fabricated by class I welding shall be radiographically examined throughout their length except as specifically exempted in other sections of this subchapter. Butt-welded pipe joints may be tested either by radiography or by the magnetic powder method.

(b) All welded joints to be radiographed shall be prepared as follows: The weld ripples or weld surface irregularities, on both the inside and outside, shall be removed by any suitable mechanical process, to a degree such that the resulting radiographic contrast due to any remaining irregularities cannot mark or be confused with that of any objectionable defect. Also the weld surface shall merge smoothly into the plate surface. The finished surface of the reinforcement may have a crown of approximately uniform amount not to exceed the following:

Plate thickness, inches:	Thickness of reinforcement, inch
Up to $\frac{1}{2}$, inclusive	$\frac{1}{16}$, maximum.
Over $\frac{1}{2}$ to 1, inclusive	$\frac{1}{16}$ to $\frac{3}{32}$.
Over 1	$\frac{3}{32}$ to $\frac{1}{4}$.

Single-welded butt joints made the equivalent of double-welded butt joints in accordance with § 56.01-5, may be radiographed without removal of backing strip provided the backing strip image will not interfere with the interpretation of resultant radiographs.

(c) The weld shall be radiographed with a technique which will determine quantitatively the size of defects with thicknesses equal to and greater than 2 percent of the thickness of the base metal. As a check on the radiographic technique, suitable thickness gauges or penetrameters shall be used in the following manner.

(d) To determine whether the radiographic technique employed is detecting defects of a thickness equal to and greater than 2 percent of the thickness of the base material, thickness gauges or penetrameters of the type shown in figure 56.05-5 (d), shall be placed on the side of the plate nearest the source of radiation and used as specified herein.

(e) The material of the penetrameter shall be substantially the same as that of the plate under examination.

(f) The thickness of the penetrameter shall be not more than 2 percent of the thickness of the plate. When the weld reinforcement and/or backing strip is not removed, a shim shall be placed under the penetrameter, such that the total thickness being radiographed under the penetrameter is the same as the total thickness through the weld, including backing strip when not removed.

(g) In each penetrameter there shall be three holes of diameters equal respectively to two, three, and four times the penetrameter thickness, but in no case less than $\frac{1}{16}$ inch, except when gamma rays are used as a source of radiation, the minimum hole need not be less than $\frac{3}{32}$ inch. The smallest hole shall be distinguishable on the radiograph.

(h) Each penetrameter shall carry an identifying number representing, to two significant figures, the minimum thickness of plate for which it may be used.

(i) The images of the identifying numbers shall appear clearly on the radiograph.

(j) At least one penetrameter shall be used for each exposure, to be placed at one end of the exposed length, parallel and adjacent to the weld seam with the small holes at the outer end. If there is any difference between the angularity of the radiation at the two ends, the penetrameter shall be placed at the end of maximum angularity. When found necessary by the inspector, two penetrameters shall be used, one at each end of the exposed region.

(k) The film during exposure shall be as close to the surface of the weld as practicable. If possible this distance shall be not greater than 1 inch. Under any conditions the ratio

Distance from source of radiation to weld surface toward radiation

Distance from weld surface toward radiation to film

shall be at least 7 to 1.

(l) All radiographs shall be free from excessive mechanical processing defects which would interfere with proper interpretation of the radiograph.

(m) Identification markers, the images of which will appear on the film, shall be placed adjacent to the weld and their location accurately and permanently marked near the weld on the outside surface of the drum or shell, so that a defect appearing on the radiograph may be accurately located in the actual weld.

(n) The radiographs shall be submitted to the inspector. If the inspector requests, the following data shall be submitted with the radiographs:

(1) The thickness of the base metal.

(2) The distance of the film from the surface of the weld.

(3) The distance of the film from the source of radiation.

(o) The acceptability of welds examined by radiography shall be judged by the following standards:

(1) Welds in which the radiographs show elongated slag inclusions or cavities shall be unacceptable if the length of any such imperfection is greater than $\frac{1}{3T}$, where T is the thickness of the thinner plate welded. If several imperfections within the above limitations exist in line, the welds shall be judged acceptable if the sum of the longest dimensions of all such imperfections is not more than T in a length of $12T$ and if the

defects are separated by at least $6L$ of acceptable weld metal, where L is the length of the longest imperfection. The maximum length of acceptable inclusion for any plate thickness shall be $\frac{3}{4}$ inch. Any slag inclusion shorter than $\frac{1}{4}$ inch shall be acceptable for any plate thickness.

(2) Welds in which the radiographs show any type of crack or zones of incomplete penetration shall be unacceptable. Incomplete penetration appears as elongated darkened lines of varying length and width in any part of the welding groove.

(3) Welds in which the radiographs show porosity shall be judged as acceptable or unacceptable by comparison with a standard set of radiographs, copies of which are on file at Coast Guard Headquarters and with the various Coast Guard District Commanders.

(p) A complete set of radiographs for each job will be retained by the Coast Guard and kept on file during the life of the boiler.

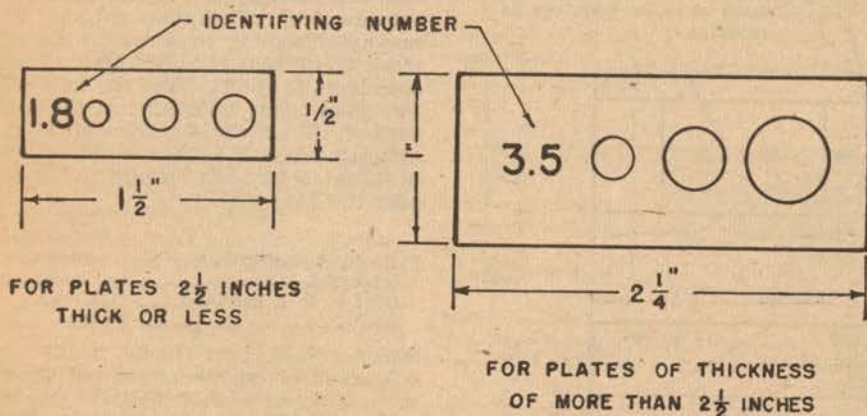
(q) When radiographing a circumferential pipe joint by placing a radium capsule inside the pipe, the penetrameters may be placed on the film side of the circumferential joint provided the manufacturer satisfies the inspector that the technique followed in doing the work is known to be adequate.

NOTE: A suggested method for proving the adequacy of the radium capsule method of radiography is as follows:

A preliminary radiograph should be made with a piece of pipe with penetrameters on both the inside and outside. The diameter of the pipe employed in making this proof radiograph should be substantially the same as that of the job in hand, and its wall thickness the practical equivalent of the overall thickness of the joint to be radiographed, including both backing ring and reinforcement if these are present in the joint to be examined. The radium capsule employed in making this proof radiograph, together with all other items of technique such as the location of the capsule and the time of the exposure, should be the same as employed on the actual job. Each penetrameter should be provided with a marker which will show up clearly on the film and which will indicate the side of the joint on which it is located: F for the film side, and R for the radiation side.

(r) When the radium capsule is placed on the axis of the joint and the complete circumference radiographed with a single exposure, four penetrameters uniformly spaced, shall be employed.

§ 56.05-10 *Hydrostatic and hammer tests.* (a) All arc or gas welded and brazed pressure vessels shall be subjected to a hydrostatic pressure of one and one-half times the maximum allowable pressure and while subjected to this pressure shall be given a thorough hammer or impact test. This impact test shall consist of striking the plate at 6-inch intervals on both sides of the welded joint, and for the full length of all welded joints. The weight of the hammer in pounds shall approximately equal the thickness of the shell in tenths of an inch, but not to exceed 10 pounds, and the plate shall be struck with a sharp swinging blow. The edges of the hammer shall be rounded so as to prevent defacing the plates.



DIAMETER OF HOLES 2, 3, AND 4 TIMES THE THICKNESS OF PENETRATOR BUT NOT LESS THAN $\frac{1}{16}$ INCH

FIGURE 56.05-5 (d)—Details of penetrameters.

(b) Following this test the pressure shall be raised to not less than twice the maximum allowable pressure and held there for a sufficient length of time to enable an inspection to be made of all joints and connections.

(c) The maximum allowable pressure for the hydrostatic tests shall be that for which the vessel is suitable at atmospheric temperature based on the actual dimensions and plate thicknesses of the vessel.

(d) Pinholes, cracks, or other defects shall be repaired only by chipping, machining, or burning out the defect and rewelding. For gas welding the metal around the defects shall be preheated to a dull red for a distance of at least 4 inches all around. Any preheating means may be used, such as a flange fire, gas or oil burner, or a welding torch. The preheating shall be done slowly, so the heat will soak into the plate and expand it thoroughly. After welding, the vessel shall be reheated in the vicinity of such weld until the heat has equalized in the dull-red spot, and then slowly cooled. For arc welding preheating or reheating is not required.

(e) Vessels requiring stress relieving shall be stress-relieved after any welding repairs have been made.

(f) After repairs have been made the vessel shall again be tested in the regular way, and if it passes the test, the inspector shall accept it. If it does not pass the test, the inspector can order supplementary repairs, or, if in his judgment the vessel is not suitable for service, he may permanently reject it.

§ 56.05-15 Inspection. (a) The manufacturer shall submit the vessel being fabricated by class I welding for inspection at such stages of partial completion as may be requested by the inspector.

(b) The first inspection of pressure vessels being fabricated by class II welding shall be done during the welding of the longitudinal joint. At this time the inspector shall check the plate material and the fit-up of the work and see that only welders who have passed the test requirements are being employed in the welded fabrication.

(c) A second inspection shall be made during the welding of the circumferential joints. At this time the inspector shall check any new material being used which may not have been examined at the time of the first inspection, also the fit-up of the vessel at this stage of construction, and again, observe the welding to see that only welders who have passed the test requirements are employed.

(d) For class III vessels one inspection shall be made during the welding of the longitudinal joint. If there is no longitudinal joint, the inspection shall be made during the welding of a circumferential joint. At this time the inspector shall check the plate material and the fit-up of the work and see that only welders who have passed the test requirements are employed in the welded fabrication.

(e) The manufacturer shall certify that the welding on the vessel has been done only by welders who have passed the test requirements and that the same

material and technique used in making the tests were employed in fabricating the vessel.

SUBPART 56.10—BRAZING

§ 56.10-1 Definition. Brazing is a group of metal-joining processes wherein the filler metal is a nonferrous metal or alloy whose melting point is higher than 800° F. but lower than that of the metals or alloys to be joined and is caused to flow, chiefly by capillarity, into the space between the two closely lapped or butted surfaces to be joined.

§ 56.10-5 Detail requirements. (a) Unfired pressure vessels and pipe may be fabricated by brazing when the temperature to which such connections may be subjected does not exceed 406° F.

(b) A manufacturer desiring to fabricate unfired pressure vessels shall conduct a process qualification test to demonstrate to an inspector that he has the proper equipment and his procedure is satisfactory for the production of acceptable work.

(c) The edges of the members to be joined shall be properly cleaned and made free from oxides, dirt, oil or grease prior to brazing. The edges of the plates may be punched and stitch riveted with centers not to exceed 3 inches or resistance welded with centers of spot welds not to exceed 1½ inches to hold the facing surfaces tightly together. The brazing shall be done by placing the flux and brazing material on one side of the joint and applying heat until the brazing material flows entirely through the lap and shows uniformly along the seam on the other side of the joint. Sufficient flux shall be used to cause the brazing to appear promptly after reaching the brazing temperature. The brazing material used shall have a shearing strength of at least 10,000 p. s. i.

(d) After the parts to be joined have been thoroughly cleaned the edges of same shall be given an even coating of flux prior to heating as a protection against oxidation.

(e) Heads shall be inserted into the shell with a tight drive or shrink fit and the protruding ends of the shell shall then be heated to a forging heat and crimped over the head.

§ 56.10-10 Materials. Ferrous and nonferrous material for use in the fabrication of shells and heads of unfired pressure vessels shall comply with any of the grades of material specified in Part 51 of this subchapter. Steel pipe may be used for shells provided same is manufactured of seamless drawn or electric-resistance welded pipe.

§ 56.10-15 Thickness and maximum allowable pressure. (a) The maximum allowable pressure for shells of brazed pressure vessels shall be determined by § 52.05-10 of this subchapter.

(b) The maximum allowable pressure for heads of brazed pressure vessels shall be determined by § 52.20-10 of this subchapter.

(c) The maximum allowable pressure for brazed piping shall be determined by § 55.07-5 of this subchapter.

§ 56.10-20 Types of joints. (a) The longitudinal joint may be of the lapped

type where the material thickness does not exceed ¾ inch. For thickness exceeding ¾ inch, but not to exceed 1 inch, the longitudinal joint shall be of the double-butt strap type.

(b) Lap joints shall have the edge of the plate lapped a distance not less than eight times the plate thickness and for double-butt joints the lap of the inner and outer strap shall be not less than 16 times the thickness of the shell plating, one-half the lap to be on each side of the abutting plate edges. When the brazed joint does not extend the full length of the plate, the unbrazed edges may be arc or gas welded provided the length of the weld is not greater than four times the thickness of the shell plate from the edge of the flange of the head.

(c) Head and circumferential joints shall be brazed in approximately the same manner as the longitudinal joint. The end of the plate shall have an overlap of not less than four times the shell thickness. When a vessel is fabricated with more than one course in the shell, the circumferential joint may be of either the lap or butt type. If of the latter type, the courses shall be approximately a true circle and the circumference of the abutting courses shall not vary by more than 0.20 percent. The sleeve may be fitted to either the inside or the outside of the shell. The overlap in either case for each course shall be not less than four times the shell thickness.

§ 56.10-25 Pipe joints. (a) Copper-alloy brazing may be employed to join pipe, valves, and fittings. Circumferential joints may be either of the butt or socket type. Where butt joints are employed, the included angle shall be not less than 90° where the wall thickness is ¼ inch or greater. The annular clearance of socket joints shall be held to small clearances which experience indicates is satisfactory for the brazing alloy to be employed, method of heating, and material to be joined. The annular clearance shall be shown on drawings submitted for approval of socket joints.

(b) Copper pipe fabricated with longitudinal joints for pressures not exceeding that permitted by Part 55 of this subchapter, may have butt, lapped, or scarfed joints. If of the latter type, the kerf of the material shall be not less than 60°.

§ 56.10-30 Silver brazing. (a) Circumferential pipe joints may be either of the socket or butt type. When butt joints are employed the edges to be joined shall be cut or machined square and the edges shall be held closely together to insure a satisfactory joint.

(b) The surfaces of the members to be joined shall be properly cleaned and given a coating of flux as required by § 56.10-5.

(c) Heat shall be applied evenly and uniformly to all parts of the joint in order to prevent local overheating.

(d) The members to be joined shall be held firmly in place until the silver brazing alloy has set so as to prevent any strain on the joint until the brazing alloy has thoroughly solidified.

(e) Clearances shall be between 0.002 inch minimum and 0.006 inch maximum.

RULES AND REGULATIONS

PART 57—INSTALLATIONS, TESTS, INSPECTIONS, REPAIRS, AND MISCELLANEOUS REQUIREMENTS

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SUBPART 57.05—INSTALLATIONS

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57.20-1 Scope.

57.20-5 Form CG 2935; boiler data report; manufacturer's certification.

57.20-10 Form CG 2936; unfired pressure vessel data report; manufacturer's certification.

57.20-15 Form CG 935A; affidavit of manufacturer of class B material or appliances.

57.20-20 Form CG 945; report of chief engineer on fusible plugs inserted in boiler.

SUBPART 57.25—FUSIBLE PLUGS

57.25-1 Definitions.

57.25-5 Detail requirements.

57.25-10 Tests.

57.25-15 Rejections.

57.25-20 Marking of fusible plugs.

57.25-25 Forwarding of samples.

AUTHORITY: §§ 57.01-1 to 57.25-25, inclusive, issued under R. S. 4405, 4417a, 4418, 4426, 4427, 4429, 4430, 4431, 4432, 4433, 4434, 4453, and 4491, as amended, sec. 14, 29 Stat. 690, 41 Stat. 305, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 363, 366, 367, 375, 391a, 392, 404, 405, 407, 408, 409, 410, 411, 412, 435, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.

SUBPART 57.01—GENERAL REQUIREMENTS

§ 57.01-1 *Scope.* The regulations in this part apply to the installations, tests, inspections, and repairs of all boilers and pressure vessels subject to inspection by the Coast Guard, and include all official forms, miscellaneous requirements, and supplementary data not covered by Parts 50 to 56, inclusive, of this subchapter.

SUBPART 57.05—INSTALLATIONS

§ 57.05-1 *Scope.* The regulations in this subpart covering the installations of boilers apply to all boilers installed on vessels subject to inspection by the Coast Guard, including auxiliary or donkey boilers.

§ 57.05-5 *Foundations.* (a) Drawings showing details of proposed foundations, or saddles, for boilers and the proposed means of bracing boilers in the vessel shall be submitted to the Officer in Charge, Marine Inspection, in the district where the installation is being made, for his approval.

(b) Provision shall be made in foundations for expansion of the boilers when heated.

(c) Boilers shall be provided with chocks to prevent movement in the event of collision unless a bolted or riveted construction satisfactorily provides for this contingency.

§ 57.05-10 *Protection of adjacent structure.* (a) Boilers shall be so placed that all parts may be readily accessible for inspection and repair.

(b) In vessels having a double bottom or other extensive surfaces directly below the boiler, as in the case of keels and girders in wooden vessels, the distance between such surface and a boiler shall in no case be less than 8 inches at the lowest part of a cylindrical boiler and not less than 18 inches under the pans of water-tube boilers.

(c) In certain types of vessels where the boiler foundation forms the ash pit, such foundations shall be efficiently ventilated, except in cases where the ash pit is partially filled with water at all times.

(d) The pans of oil-burning, water-tube boilers shall be arranged to prevent oil from leaking into the bilges and shall be lined with fire brick or other heat resisting material.

(e) In vessels constructed of wood or having wood structure adjacent to boilers or uptakes such structure shall be protected by noncombustible, nonconducting material covered with sheet metal, and the distance between the wooden structure and the uptakes and funnels shall in no case be less than 12 inches.

(f) The distance between a boiler and a compartment containing fuel oil shall not be less than 24 inches at the back end of a boiler and 18 inches elsewhere, except that for a cylindrical part of a boiler or a knuckle in the casing of a water-tube boiler, these distances may be reduced to 18 and 12 inches, respectively, provided the requirements of paragraph (a) are complied with.

(g) All oil-burning boilers shall be provided with oil-tight drip pans under the burners and elsewhere where necessary to prevent oil draining into the bilges.

§ 57.05-15 *Dampers.* Where dampers are installed in the uptakes or funnels, the arrangement shall be such that it will not be possible to shut off the gas passages from the operating boilers.

§ 57.05-20 *Installation of refrigerating machinery.* Where refrigerating machines are installed in which anhydrous ammonia is used as a refrigerant, such machines shall be located in a well-ventilated, isolated compartment, preferably on the deck, but in no case shall it be permissible to install such machine in the engine-room space unless it can be so vented and isolated as to eliminate any hazard from gas escaping to the engine room. Absorption machines using a solution of aqua ammonia and machines using carbon anhydride (CO₂ gas) are exempt from this requirement, provided the maximum charges that might be released in the event of breakage do not exceed 300 pounds.

SUBPART 57.10—TESTS AND INSPECTIONS

§ 57.10-1 *Preparation of boilers for inspection.* It shall be the duty of the chief engineer to have the boilers which are to be inspected filled with water, safety valves secured by gags or clamps, tubes swept, back connections and furnaces cleaned out, grate bars and bridge walls removed, and to have the water in boilers at a temperature not more than 180° F. for water-tube boilers and not more than 100° F. for fire-tube boilers.

§ 57.10-5 *Tests and inspection of new boilers.* (a) When a new boiler is installed in a vessel, a hydrostatic pressure equal to one and one-half times the maximum allowable pressure shall be applied before the boilers are covered, and it shall be the duty of the inspector to make a careful examination of the exterior of the boiler, furnaces, back connections, tubes, and of every part that can be examined while under test, in order to satisfy himself that there are no defects in workmanship or material, and that the boiler shows no signs of weakness under the test.

(b) After the test, the boiler shall be emptied, manhole and handhole plates removed, and, unless it is physically impossible to do so, the inspector shall enter the boiler and make a thorough examination of the interior to satisfy himself that the workmanship is good, that no defects have occurred due to the hydrostatic test, and that the boiler is safe for the maximum allowable pressure for which it was approved. Where it is not possible for the inspector to enter the boiler, he shall specifically state in his report the reasons for not so doing.

(c) Upon completion of the hydrostatic test and the boiler examination under the preceding paragraphs (a) and (b) and after the installation of the brick work and lagging, those boilers that are to be operated at a pressure equal to or in excess of 400 pounds per square inch gauge, or at a steam temperature equal to or in excess of 700° F., may, at the request of the owner or builder, be given an additional test under steam in accordance with the following:

(1) The steam pressure applied to the boilers and to the main and auxiliary steam piping shall not exceed one and one-fourth times the maximum allow-

able pressure. Sufficient steam is to be bled from the superheater outlet, either by operating auxiliary machinery, or discharging to the atmosphere, so that service temperatures will not be exceeded. For this test the regular safety valve springs should be replaced by springs designed to operate at the test pressure. After the conclusion of this test the test springs are to be replaced with springs designed to operate at the maximum allowable pressure.

(2) The inspector shall make a careful examination of all parts of the system during the test, and assure himself that the boilers may be operated safely at the pressure allowed. A notation to that effect shall be entered on form CG 840-B.

(3) The inscription on the boiler and the boiler name plate, as required in paragraph (d), shall contain the following entry for steam tests: "Steam test (--- p. s. i.)," which shall follow the notation for hydrostatic test.

(d) (1) Upon completion of the inspection of a new boiler and after the inspector has determined that the boiler complies with the approved plans, that the workmanship and material are satisfactory, and that the boiler is safe for the design pressure for which it is approved, the inspector shall have stamped on the front head of fire-tube boilers and on the drum head of water-tube boilers the following data:

Name of fabricator and serial number	p. s. i.
Design pressure	p. s. i.
Hydro test pressure	p. s. i.
Steam test pressure	p. s. i.
U. S. C. G. No.	
C. G. Symbol	
Inspector's initials	
Month and year fabricated	

(2) The data shall be legibly stamped and shall not be obliterated during the life of the boiler. In the event that the portion of the boiler upon which the data is stamped is to be insulated or otherwise covered, the data shall be transferred to a metal name plate which shall be attached to the boiler casing or the uptake. The name plate shall be maintained in a legible condition so that the data can be easily read.

§ 57.10-15 Tests and inspections of boilers and main steam pipes in service.

(a) The boilers of all vessels subject to inspection by the Coast Guard, and other equipment as stipulated in this subpart, shall be subjected to annual tests and inspections. At each annual inspection boilers in service, which can be satisfactorily examined internally, shall be subjected to a hydrostatic test equal to one and one-fourth times the maximum working pressure; types of boilers which due to design cannot be satisfactorily examined internally, shall be subjected to a hydrostatic test equal to one and one-half times the maximum working pressure; also, boilers to which extensive repairs have been made, or the

strength of which the inspector has any reason to doubt, shall be subjected to a hydrostatic test of one and one-half times the maximum working pressure. The inspector, whenever he deems it necessary in the interest of safety, or whenever evidence of moisture or leakage appears, shall have part or all the covering or lagging of the boiler removed so that a complete examination of the exterior parts of the boiler may be made.

(b) In applying hydrostatic pressure to boilers, arrangements shall be made to prevent main and auxiliary stop valves from being subjected at the same time to hydrostatic pressure on one side and steam pressure on the opposite side. Vessels on going out of service or laying up in winter quarters, and beginning the annual inspection, may have the hydrostatic pressure applied to boilers at any time preceding the date of the final inspection, but in no instance shall the vessel be navigated to exceed 12 months from the date of issue of the certificate of inspection without the application of the hydrostatic pressure, except as provided in R. S. 4421, as amended (46 U. S. C. 399).

(c) The hydrostatic test shall be witnessed by the inspectors, and they shall observe and note the indication upon the gauge, stating in their report the hydrostatic pressure applied in pounds per square inch.

(d) The hydrostatic test shall be applied to the main steam piping from the boiler to the throttle valve in the same ratio as applied to the boiler. If the covering of the piping is not removed, a test pressure 15 percent in excess of the maximum working pressure shall be held on the piping for a period of 10 minutes, and, if any evidence of moisture or leakage is detected, the covering shall be removed and the pipe thoroughly examined. The inspector may, however, order the covering removed at any time if he deems it necessary.

(e) The inspector shall subject such parts as stays, flues, furnaces, and such other parts of the boiler as he deems necessary to a hammer test.

(f) If the inspector has reason to believe that the boiler has deteriorated to any appreciable extent under the bottom where it rests on saddles or foundations, he shall cause the boiler to be lifted to such position that it can be thoroughly examined, provided the examination cannot be made otherwise.

(g) In the inspection of water-tube boilers, the inspector shall carefully examine the ligaments between rivets and between tube holes to ascertain if any cracks have started. In addition to the pressure parts, he shall examine the casing, brickwork, and baffles. If any part is found in bad condition, he shall require such repairs or renewals as may be necessary.

(h) The inspector shall examine the edges of manholes or other openings and the edges of lap-riveted joints to ascertain if any cracks have started in the plate.

(i) The inspector may require a boiler to be drilled to determine the actual thickness at any time if doubt exists as to its safety. However, after a boiler has

been installed for 10 years, the inspector, at the first annual inspection thereafter, and at such subsequent periods as may be deemed necessary, shall cause the boiler to be drilled at or near the water line and bottom, and at such other places as he may deem necessary, for the purpose of gauging the shell to determine if it has deteriorated. If the thickness found by actual measurement is less than the original thickness, the boiler shall be recalculated and the maximum allowable pressure shall be based on the least thickness found.

§ 57.10-20 Inspection of mountings and attachments—(a) Boiler stop valves and mountings. The Officer in Charge, Marine Inspection, shall require all valves on boilers to be opened up every 4 years at the time of annual inspection or at the next regular drydocking period thereafter. All valves shall be removed from the boiler at least once in every 8 years to determine the condition of the stud bolts connecting the valves to the boiler. These examinations may be made at intermediate periods if there is any evidence to indicate that defects have started or excessive corrosion exists. A record of the inspection of the valves will be made on form CG 840-B, and a notation made on the certificate of inspection, this notation to be carried on each certificate until the next period for the regular examinations arrives.

(b) Safety valves. (1) Boiler safety valves shall be set under steam pressure by an inspector.

(2) At the annual inspection of each vessel the inspector shall check the setting of each boiler safety valve and make any adjustments that may be necessary to keep the boiler within the maximum allowable pressure. After adjusting the boiler safety valves, the inspector shall seal each safety valve separately with the official seal of the Coast Guard.

(3) Each chief engineer, upon taking charge of the power plant of a vessel, shall examine all safety valves and, if any seals are found broken, or there is evidence that valves have been tampered with, he shall report same in writing to the Officer in Charge, Marine Inspection, in the district in which the vessel is located. If at any time it is necessary to break the seal on a safety valve for any purpose, the chief engineer shall advise the Officer in Charge, Marine Inspection, in writing at the next port of call, giving the reason for breaking the seal and requesting that the valve be examined and adjusted by an inspector.

(c) Fusible plugs. The inspector shall examine fusible plugs when inspecting the boilers, and, provided they have been renewed prior to his visit, shall report the number of such plugs inserted in each boiler, the manufacturer's name, and the heat number, on form CG 840-B. It shall be the duty of the chief engineer to report the renewal of such plugs on form CG 945 to the Officer in Charge, Marine Inspection, in the district in which the inspection is being made. In the event that it should become necessary to install new plugs between annual inspections, it shall be the duty of the chief engineer to report same on form CG 945, and, under the heading, "Re-

marks," to give the reason why such renewal was necessary. (See § 57.20-20.)

(d) *Water columns, test cocks, and water gauges.* Water columns, test cocks, and water gauges shall be carefully examined, tested, and checked by the inspector at each inspection.

(e) *Steam gauges.* All steam gauges connected to boilers or main steam lines shall be carefully checked for accuracy.

(f) *Safety valves or relief valves on reduced-pressure lines, evaporators, etc.* Inspectors shall give the same attention and inspection to safety valves or relief valves installed on reduced-pressure lines, evaporators, superheaters, feed-water heaters, etc., as to the safety valves installed on the main boilers; that is, such valves shall be subjected to operating tests when installed to determine that they have sufficient capacity to serve as a warning in the event of the failure of the reducing valve, and also to prevent building up an excess pressure before the shut-off valve can be closed. The setting of such valves shall be carefully checked at each annual inspection and adjusted if necessary.

§ 57.10-21 *Dangerous places.* Inspectors shall examine all places where there is a possibility of a person being caught in the machinery to see that they are provided with substantial guards over such mechanisms as gears and couplings; also flywheels of electric generators, refrigerating machines, etc.

§ 57.10-22 *Radius of dished heads.* The following formula shall be used to determine the radius of dished heads:

$$R = \frac{H}{2} + \frac{C^2}{8H} \quad (1)$$

where:

R = radius of dish, in inches.

C = chord, or distance, straight across between two points on the inner surface of the head, in inches (see note).

H = distance from the middle point of chord C to the inner surface of the head, measured at right angles to the chord, in inches.

NOTE: The distance C should be taken as large as practicable, but small enough so that no portion of the rounded surface at A which joins the flange and the dished portion of the head will be included in the measurements. (See figure 57.10-22.)



FIGURE 57.10-22—Method for measuring the radius of dished heads.

§ 57.10-23 *Tolerances for ellipsoidal heads.* Heads of ellipsoidal form shall be checked for their conformity to the true elliptical shape. The manufacturer of such heads shall furnish the inspector with a template made of wood or metal which shall be made as nearly exact, true semielliptical, as practicable. The total tolerance at points A or B in figure 57.10-23 shall not exceed $1\frac{1}{4}$ percent of the inside diameter of the head.

§ 57.10-25 *Life of new boiler installation.* The life of a new boiler installation, within the meaning of the regulations in this subchapter, shall begin with

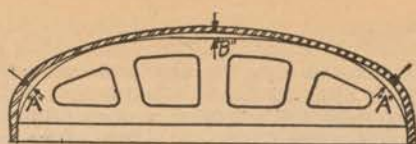


FIGURE 57.10-23—True semielliptical template points for measurement of tolerances of ellipsoidal heads.

the date of the issuance of the first certificate of inspection to the vessel in which such boiler or boilers are installed.

§ 57.10-30 *Standard practice for hydrostatic tests of boilers and appurtenances to determine pressure rating.* Where it is necessary to test a boiler structure, pressure vessel, or appurtenance, or any pressure part thereof, to determine a pressure rating in accordance with the provisions of § 52.01-70 of this subchapter the following procedure shall be adhered to as closely as practicable:

(a) *Materials.* The structure shall be made from material conforming to the requirements of the appropriate subpart of Part 51 of this subchapter.

(b) *Workmanship.* The dimensions and minimum thickness of the structure to be tested shall not vary materially from those actually used. If possible, the structure to be tested may be selected at random from a quantity of such intended for use.

(c) *Preparation for test.* (1) It is necessary to test only the weakest point of the structure but several points may be checked to make certain that the weakest one is included. The less definite the location of the weakest point, the more points shall be checked.

(2) The movement of the reference points may be measured with reference to a fixed surface, or two reference points may be located on opposite sides of a symmetrical structure and the total deformation between those two points measured.

(3) Indicating micrometer gauges accurate to 0.001 inch are most suitable for measuring deformation of the structure at the reference points although any form of accurate micrometer may be used.

(4) A hand-test pump is satisfactory as a source of hydrostatic pressure. Either a test gauge or a reliable gauge which has been calibrated with a test gauge shall be attached to the structure.

(5) The maximum hydrostatic pressure that shall be provided for will vary from two to three times the expected maximum allowable pressure for carbon-steel structures.

(6) The location of the weakest point of the structure may be determined by applying a thin coating of plaster of paris or similar material, and noting where the surface coating starts to break off under hydrostatic test. The coating shall be allowed to dry before the test is started.

(d) *Hydrostatic tests.* (1) The first application of hydrostatic pressure shall be approximately the expected maximum allowable pressure, or the tests may be arranged with a view to making not less than 10 applications of pressure in approximately equal increments between

the initial test pressure and the final test pressure.

(2) When each increment of pressure has been applied, the valve between the pump and the structure under test shall be closed and the pressure gauge watched to see that the pressure is maintained and no leakage occurs. The total deformation at the reference points shall be measured and recorded and the hydrostatic pressure also recorded. The pressure shall then be released and each point checked for any permanent deformation which may be recorded. Only one application of each increment of pressure is necessary. The pressure shall be increased by substantially uniform increments, and readings taken until the elastic limit of the structure has obviously been exceeded.

§ 57.10-35 *Physical characteristics of metal.* (a) The tests should be made so that the following physical properties of the metal may be determined.

(1) Tensile strength.

(2) Proportional limit.

(b) After the test is completed, if it is deemed necessary, coupons may be cut from the specimen tested, and machined to standard $\frac{1}{2}$ by 2 inch gauge-length specimens. (See figure 51.04-35 (f).) These coupons should be representative of the metal at the weakest sections of the structure and their axes should preferably be parallel to the direction of greatest stress. The coupons shall not be cut out of the specimen with a gas torch.

(c) In plotting curves, a single cross-section sheet may be used for each reference point of the structure. A scale of 1 inch=0.01 inch deformation, and a scale of at least 1 inch equals the approximate test pressure increments has been found satisfactory. Plot two curves for each reference point, one showing total deformation under pressure and one showing permanent deformation when the pressure is removed.

(d) In determining the proportional limit of pressure parts, the following procedure shall be employed:

(1) Locate the proportional limit on each curve of total deformation as the point at which the total deformation ceases to be proportional directly to the hydrostatic pressure. Draw a straight line that will pass through the average of the points that lie approximately in a straight line. The proportional limit will occur at the value of hydrostatic pressure where the average curve through the points deviates from the straight line.

(2) In pressure parts such as headers, where a series of similar weak points occur, the average hydrostatic pressure corresponding to the proportional limits of the similar points may be used.

(3) The proportional limit obtained from the curve of total deformation may be checked from the curve of permanent deformation by locating the point where the permanent deformation begins to increase regularly with further increases in pressure. Permanent deformations of a low order that occur prior to the point actually corresponding to the proportional limit of the structure, resulting from the equalization of stresses and ir-

regularities in the material, may be disregarded.

(4) It should be made certain that the curves show the deformation of the structure and not slip or displacement of reference surfaces, gauges, or the structure.

(e) (1) Having determined the proportional limit of the weakest point of the structure, the maximum allowable pressure may be determined by the formula:

$$P = \frac{HS}{5E} \quad (1)$$

where:

P = maximum allowable pressure, in p. s. i.

H = hydrostatic pressure at the proportional limit of the pressure part, in p. s. i.

S = average tensile strength of material, in p. s. i.

E = average proportional limit of the material, in p. s. i.

(2) As an alternate method of determining the maximum allowable pressure, eliminating the necessity of cutting coupons for tensile tests, the proportional limit of the material may be considered as two-fifths of its tensile strength. The maximum allowable pressure may then be taken as one-half of the hydrostatic pressure corresponding to the proportional limit of the pressure part.

(f) A retest should be allowed on an additional structure if errors or irregularities are obvious in the results.

§ 57.10-37 Allowable load on stays and staybolts of various diameters. (a) The allowable loads based on the net cross-sectional areas of staybolts with V threads, may be computed by one of the formulas in this section. The use of Whitworth threads with other pitches is permissible. The formula for the diameter of a staybolt at the bottom of a V thread is as follows:

$$D - (p \times 1.732) = d \quad (1)$$

where:

D = diameter of staybolt over the threads, in inches.

p = pitch of threads, in inches.

d = diameter of staybolt at bottom of threads, in inches.

(b) When United States threads are used, the formula becomes as follows:

$$D - (p \times 1.732 \times 0.75) = d \quad (2)$$

(c) Tables 57.10-37 (c1) and 57.10-37 (c2) give the allowable loads on net cross-sectional areas for staybolts with V threads having 12 and 10 threads per inch.

TABLE 57.10-37 (c1)—ALLOWABLE LOADS ON STAYBOLTS WITH V THREADS, 12 THREADS PER INCH

Outside diameter of staybolts, inches	Diameter at bottom of thread, inches	Net sectional area at bottom of thread, square inches	Maximum stress, 6,000 pounds per square inch
3/4	0.7500	0.6057	1,728
13/16	.8125	.6682	2,106
7/8	.8750	.7307	2,514
15/16	.9375	.7932	2,954
1	1.0000	.8557	3,432
1 1/16	1.0625	.9182	3,972
1 1/8	1.1250	.9807	4,530
1 1/4	1.1875	1.0432	5,130
1 3/8	1.2500	1.1057	5,760
1 1/2	1.3125	1.1682	6,432
1 5/8	1.3750	1.2307	7,140
1 3/4	1.4375	1.2932	7,878
1 7/8	1.5000	1.3557	8,664

TABLE 57.10-37 (c1)—ALLOWABLE LOADS OF STAYBOLTS WITH V THREADS, 12 THREADS PER INCH—CON.

Outside diameter of staybolts, inches	Maximum stress, 7,500 pounds per square inch	Maximum stress, 8,000 pounds per square inch	Maximum stress, 9,000 pounds per square inch
3/4	0.7500	2.160	2.304
13/16	.8125	2.632	2.808
7/8	.8750	3.142	3.352
15/16	.9375	3.705	3.952
1	1.0000	4.312	4.600
1 1/16	1.0625	4.965	5.296
1 1/8	1.1250	5.662	6.040
1 1/4	1.1875	6.412	6.840
1 3/8	1.2500	7.200	7.680
1 1/2	1.3125	8.040	8.576
1 5/8	1.3750	8.925	9.520
1 3/4	1.4375	9.849	10.504
1 7/8	1.5000	10.830	11.552

TABLE 57.10-37 (c2)—ALLOWABLE LOADS ON STAYBOLTS WITH V THREADS, 10 THREADS PER INCH

Outside diameter of staybolts, inches	Diameter at bottom of thread, inches	Net sectional area at bottom of thread, square inches	Maximum stress, 6,000 pounds per square inch
1 1/4	1.2500	1.0768	6,466
1 3/8	1.3125	1.1393	6,114
1 1/2	1.3750	1.2018	6,804
1 5/8	1.4375	1.2643	7,530
1 3/4	1.5000	1.3268	8,292
1 7/8	1.5625	1.3893	9,090
2	1.6250	1.4518	9,930

Outside diameter of staybolts, inches	Maximum stress, 7,500 pounds per square inch	Maximum stress, 8,000 pounds per square inch	Maximum stress, 9,000 pounds per square inch
1 1/4	1.2500	6,832	7,288
1 3/8	1.3125	7,642	8,152
1 1/2	1.3750	8,505	9,072
1 5/8	1.4375	9,412	10,040
1 3/4	1.5000	10,365	11,056
1 7/8	1.5625	11,362	12,120
2	1.6250	12,412	13,240

(d) Table 57.10-37 (d) shows the allowable loads on net cross-sectional areas of round stays or braces.

TABLE 57.10-37 (d)—ALLOWABLE LOADS ON ROUND BRACES OR STAY RODS

Minimum diameter of circular stay, inches		Net cross-sectional area of stay, square inches	Allowable stress, in pounds per square inch, net cross-sectional area				
			6,000	7,500	8,000	9,000	10,000
			Allowable load, in pounds, on net cross-sectional area				
1	1.0000	0.7854	4,712	5,890	6,283	7,068	7,854
1 1/16	1.0625	.8896	5,320	6,649	7,092	7,979	8,866
1 1/8	1.1250	.9940	5,964	7,455	7,932	8,946	9,940
1 1/4	1.1875	1.1075	6,645	8,306	8,860	9,967	11,075
1 3/8	1.2500	1.2272	7,326	9,204	9,817	11,044	12,272
1 1/2	1.3125	1.3530	8,118	10,147	10,824	12,177	13,590
1 5/8	1.3750	1.4849	8,909	11,136	11,879	13,364	14,849
1 3/4	1.4375	1.6230	9,738	12,172	12,964	14,607	16,230
1 7/8	1.5000	1.7671	10,602	13,253	14,136	15,903	17,671
2	1.5625	1.9175	11,505	14,381	15,340	17,257	19,175
2 1/16	1.6250	2.0739	12,443	15,554	16,591	18,665	20,739
2 1/8	1.6875	2.2365	13,419	16,773	17,892	20,128	22,365
2 1/4	1.7500	2.4053	14,431	18,039	19,242	21,647	24,053
2 3/8	1.8125	2.5802	15,481	19,351	20,641	23,221	25,802
2 1/2	1.8750	2.7612	16,567	20,709	22,089	24,850	27,612
2 5/8	1.9375	2.9483	17,689	22,112	23,586	26,534	29,483
2 3/4	2.0000	3.1416	18,849	23,562	25,122	28,274	31,416
2 7/8	2.1250	3.3406	20,047	25,059	26,712	30,019	33,406
3	2.2500	3.5461	21,279	26,599	28,372	32,019	35,466
3 1/16	2.3750	3.7581	22,543	28,179	30,000	34,269	37,619
3 1/8	2.5000	3.9766	23,840	29,820	31,808	35,784	39,761
3 1/4	2.6250	4.2016	25,169	31,500	33,640	37,576	41,994
3 3/8	2.7500	4.4331	26,530	33,211	35,440	39,507	44,319
3 1/2	2.8750	4.6711	27,924	34,947	37,272	41,677	46,739
3 5/8	3.0000	4.9156	29,350	36,719	39,134	43,984	49,254
4	3.1416	5.1666	30,807	38,524	41,034	46,529	51,864

§ 57.10-40 Requirements for fuel oil. (a) Oil to be used as fuel on vessels subject to inspection by the Coast Guard shall have a flash point of not less than 150° F. (closed cup test).

(b) It shall be the duty of the chief engineer to make an entry in the log of each supply of fuel oil received on board, stating the quantity received, the name of the vendor, the name of the oil producer, and the flash point (closed cup test) for which it is certified by the producer.

(c) It shall be the further duty of the chief engineer to draw and seal at the time the supply is received on board, a half-pint sample of each lot of fuel oil, such sample to be preserved until that particular supply of oil is exhausted.

§ 57.10-45 Request for increase of pressure. When a certain maximum

allowable pressure has been fixed by an Officer in Charge, Marine Inspection, for a particular boiler installation, no increase of pressure shall be granted, unless such increase is justified by a careful check up of the test reports of the material used in the construction of the boiler and the design as shown by the approved drawings together with the condition of the boiler or boilers at the time the request is made. In no case shall it be permissible to increase the maximum allowable pressure unless such increase is sanctioned by the Commandant.

§ 57.10-50 Inspection of boilers of foreign-built vessels admitted to American registry. (a) Where foreign-built vessels are admitted to American registry the Officer in Charge, Marine Inspection, shall endeavor to secure drawings from which the boilers were constructed and a

record of the chemical and physical properties of the material entering into the construction of the boilers. Before a certificate of inspection of a vessel is issued by any Officer in Charge, Marine Inspection, the requirements of this section shall be met.

(b) The drawings if available shall be examined to determine the maximum allowable pressure in accordance with the regulations in this subchapter, and the test reports of the material shall be carefully checked to determine whether the material used in the construction of the boilers is safe.

(c) The boiler or boilers shall be measured in order to obtain accurate data, which data shall be embodied in the report of the inspector making the examination. All plates shall be drilled and gauged by the inspector to determine the actual thickness, and upon the thickness thus obtained the maximum allowable pressure shall be based. The furnaces shall be trammed to ascertain if there is any distortion. The safety valves and mountings shall be thoroughly examined to determine if they are in good working condition and if their capacity is ample to insure safety.

(d) Each section of the steam pipe shall be drilled and gauged, and, where bends occur in the piping, they shall be drilled in the outer wall of the bends to determine the thickness thereof.

(e) When the inspection is completed and steam is raised on the boilers, an accumulation test shall be conducted, where required, in accordance with the provisions of § 52.65-10 of this subchapter to establish the fact that the safety valves have ample relieving capacity.

(f) Where drawings of the boilers and test reports of the material entering into their construction cannot be obtained, the maximum allowable pressure shall be based on the actual thickness of material found and an assumed tensile strength not to exceed 60,000 p. s. i., together with the general condition of the boilers: *Provided*, That the maximum allowable pressure thus obtained shall not exceed in any case the maximum pressure allowed by the certificate issued by the government under whose flag the vessel formerly operated.

§ 57.10-55 *Sea chests, sea valves, and strainers.* Sea chests, sea valves, and strainers shall be carefully examined by the inspector when the vessel is in dry dock, and, if he deems it necessary, he may order them opened up for internal examination. This also applies to bilge injection valves.

§ 57.10-60 *Trial-trip observance.* On the trial trip of each new vessel an inspector shall be present to observe, from a standpoint of safety, the operation of boilers, engines, steering gear, and auxiliaries; and, if not satisfied with the performance of such boilers and machinery, he shall make such requirements as in his judgment will overcome any deficiencies which may have come under his observation.

§ 57.10-65 *Inspectors not to accept statements.* Inspectors shall be guided by conditions as actually found by them,

and in no case shall they be justified in accepting the statements of others.

SUBPART 57.15—REPAIRS

§ 57.15-1 *Welding repairs to boilers and unfired pressure vessels.* (a) Repairs to marine boilers or unfired pressure vessels by means of arc or gas welding may be permitted provided such welding conforms to the requirements of Part 56 in the following particulars, viz: That the welders are qualified in accordance with the provisions of § 56.01-10 of this subchapter, and that the quality of the welds shall conform with the requirements of § 56.01-55 of this subchapter. Repair welding shall be limited in its application to those cases where the stress is carried by other construction which conforms to the requirements of this subchapter, and where the safety of the boiler or pressure vessel is not dependent upon the strength of the welds. It shall be the duty of firms and corporations, and also the engineer in charge of the vessel, to notify the Officer in Charge, Marine Inspection, giving the location of the vessel, the nature of the proposed repairs, and the date and time at which the work will begin. No repairs by arc or gas welding shall be permitted before an inspection is made by an inspector and the proposed method of repair sanctioned by him. In cases where no inspector is available the chief engineer may communicate with the nearest Officer in Charge, Marine Inspection, advising of the nature of the proposed repairs. If permission is granted by the Officer in Charge, Marine Inspection, the repairs may be made and a written report signed by the chief engineer shall be submitted to the Officer in Charge, Marine Inspection, who sanctioned the repairs.

(b) If, in the opinion of the inspector, a hydrostatic test is necessary to prove the integrity of the welded repairs, such a test shall be applied when the work is completed, the hydrostatic pressure applied to be not more than 10 percent in excess of the maximum allowable pressure.

(c) No repairs by welding of any kind, except where welding is specifically sanctioned by the regulations in this subchapter or where specified herein, shall be permitted on any part or parts of a boiler and its appurtenances or on any unfired pressure vessel.

(d) Arc or gas welding may be permitted in staybolted surfaces or surfaces adequately stayed by other means, so that should the welds fail, the parts would be held together by the stays. Staybolted surface, within the meaning of this subchapter, is a surface which lies between rows of stays or staybolts.

(e) Arc or gas welding of cracks and fractures in cast-iron heating boilers or unfired pressure vessels shall be referred to an inspector for inspection.

(f) Cracks in circumferential seams, extending from the calking edge of the plate to the rivet hole, may be arc or gas welded, provided the cracks are properly prepared to permit fusion through the entire thickness of the plate.

(g) Cracks extending from rivet hole to rivet hole shall not be repaired by welding where the plate is subject to tensile stress.

(h) Cracks in a staybolted surface may be repaired by welding.

(i) Circumferential or lengthwise cracks not exceeding 20 inches in length in corrugated furnaces, may be repaired by welding.

(j) Wherever practicable, cracks shall be prepared for welding by veeing out the crack on both sides of the plate in order to form a double V-weld.

(k) Cracks in the shells or drums of power boilers, except as otherwise specified herein, shall not be welded.

(l) It shall not be permissible to reinforce or build up by arc or gas welding the heads of rivets or staybolts that have deteriorated. Such rivets or staybolts shall be removed.

(m) Calking edges of circumferential seams may be built up by arc or gas welding to the original thickness under the following conditions: The thickness of the original metal to be built up between rivet holes and calking edge shall not be less than one-fourth of the diameter of the rivet hole, and the portion of the calking edge to be thus reinforced shall not exceed 30 inches in length in a girthwise direction. In all repairs to circumferential seams by arc or gas welding, the rivets shall be removed over the portions to be welded for a distance of at least 6 inches beyond the repaired portion. After repairs are made the rivet holes shall be reamed before the rivets are re-driven.

(n) Where leaks occur in riveted joints or connections, they shall be carefully investigated to determine the cause. Such leaks may be made tight by seal welding the edge, if, in the judgment of the Officer in Charge, Marine Inspection, this will make a satisfactory repair.

(o) It shall not be permissible to build up or reinforce a grooved or corroded area of unstayed internal surfaces by means of arc or gas welding, except that widely scattered pit holes may be built up by arc or gas welding.

(p) Where external corrosion has reduced the thickness of flat plates around hand holes to an extent of not more than 40 percent of the original thickness and for a distance not exceeding 2 inches from the edge of the hole, the plate may be built up by arc or gas welding.

(q) Where stayed sheets have corroded to a depth not exceeding 40 percent of their original thickness, they may be reinforced or built up by arc or gas welding. Where the staybolts are fitted with riveted heads, the staybolts in the reinforced area shall be renewed in accordance with the provisions of subparts 52.30 and 52.35, but where the staybolts are fitted with nuts, the nuts may be removed and after reinforcing has been applied, collars may be welded around the staybolts in lieu of the nuts. Such reinforced area shall not exceed 400 square inches nor more than 30 inches in one direction. Two such areas in any one plate may be reinforced, provided that the distance between the reinforced surfaces is not less than 30 inches.

(r) When the corroded portion of a staybolted surface exceeds 400 square inches, it shall be permissible to repair the same by cutting out the defective portion and replacing it with a new plate, the edges of the new plate to be welded

in position. In such cases, new staybolts shall be fitted in accordance with the requirements of subparts 52.30 and 52.35.

(s) Flat tube sheets in fire-tube boilers which have corroded or where cracks exist in the ligaments may be repaired by arc or gas welding.

(t) Unreinforced openings in the shells or drums of boilers or pressure vessels, the diameter of which does not exceed the maximum diameter of an unreinforced opening in accordance with figures 52.25-15 (b1) and 52.25-15 (b2), may be closed by the use of a patch or plate inside the drum or shell and sealed against leakage by arc or gas welding. Such plates shall have a diameter at least 2 inches larger than the diameter of the hole and shall have a thickness equal to the thickness of the plate to which it is attached. It shall not be permissible to insert such patches in the shell or head flush with the surrounding plate.

(u) Boiler tubes intended for use in the repair of fire-tube boilers may be re-ended or pieced provided the re-ending is done by means of the electric-resistance butt welding or hammer weld methods.

(v) Portions of tube sheets which have deteriorated may be renewed by replacing the wasted portion with a new section. The ligaments between the tube holes may be joined by means of arc or gas welding and stay tubes or other acceptable means of relieving the stress on the repaired section may be installed if in the judgment of the Officer in Charge, Marine Inspection, it is necessary to do so.

(w) Where leaks develop around staybolts which are otherwise in good condition, the nuts may be replaced with a beveled collar formed around the end of the stay by means of arc or gas welding. In such cases, the depth of the collar measured on the stay and the width measured on the plate, shall be equal to one-half the diameter of the staybolt. (See figure 52.35-1 (I).)

(x) Any method of repairs by means of arc or gas welding not covered by the regulations in this subchapter, shall be referred to the Commandant, and may be authorized by him if, in his opinion, it meets with the obvious intent of the regulations in this subchapter.

§ 57.15-5 Welding repairs to defective carbon-steel castings. (a) Defects in carbon-steel castings, such as valve bodies, pipe fittings, channels, covers, manifolds, and other pressure-containing appliances, may be repaired by arc or gas welding.

(b) Defects in carbon-steel castings shall be classed as follows:

(1) *Minor defects.* Minor defects are undersized defective areas resulting from oxy-acetylene cutting, grinding, or chipping during cleaning operation, surface sand or slag defects or other slight surface defects except cracks or cold shuts. The excavated depth of a minor defect shall not exceed 20 percent of the wall thickness or 1 inch, whichever is the lesser. No lineal dimension shall exceed four times the wall thickness or be greater than 6 inches, whichever is the lesser.

(2) *Major defects.* All defects exceeding the depth or size given in paragraph (b) (1) of this section shall be considered a major defect, which shall be repaired in the same manner as a minor defect. Repairs of major defects shall be nondestructively tested as required by paragraph (h) of this section.

(c) Prior to any welding, all defective material shall be removed until the base metal is shown to be sound. Defective areas of castings may be removed by chipping, grinding, drilling, or oxy-acetylene grooving to a sufficient depth to insure that the remaining base metal is shown to be sound by acid etching, radiography or magnetic particle testing. The latter methods of testing are preferred. Any slag remaining after oxy-acetylene grooving shall be completely removed by chipping or grinding. When defects are removed by drilling, the resulting hole shall be countersunk to a depth of at least 25 percent of the metal thickness with a bevel of the included angle being not less than 45°.

(d) Prior to welding, the cavity and the adjoining area shall be preheated to a temperature suitable for the chemical elements and thickness of metal involved which experience indicates is satisfactory. Castings shall be preheated to a temperature which experience indicates is suitable for the chemical elements and thickness of the casting when lugs, supports, ribs, or bosses are to be welded thereto.

(e) Castings other than those which have been repaired for minor surface defects, the excavated dimensions of which do not exceed the limitations specified by paragraph (b) (1) of this section, shall be stress-relieved in a furnace to a temperature of from 1,100° F. to 1,200° F. for 1 hour per inch of maximum thickness and allowed to cool in the furnace to 500° F. before removal.

(f) Filler metal used in the repair of defective steel castings shall be acceptable electrodes in accordance with § 56.01-20 of this subchapter and shall meet the chemical and physical properties of the base metal.

(g) The defective material removed shall be replaced using pipe welders qualified in accordance with Qualification Test No. 4 for the position in which the welding is to be done as given in § 56.01-10 of this subchapter. The use of welders qualified to weld plate shall be permitted provided the welding is done in the flat position.

(h) Completed welds shall be inspected for cracks and other defects by magnetic particle testing, and in the case of major repairs, the welded area shall be examined by radiography if the casting is to be used in steam lines subject to boiler pressure, boiler feed, or blow-off lines. Prior to the use of magnetic particle inspection, the welds shall be made smooth and free of grooves or depressions.

(i) After repair of defective castings has been completed a hydrostatic test as outlined in table 55.07-15 (e10) or 55.07-15 (e11) based upon the primary service pressure rating shall be applied.

§ 57.15-10 Welding repairs to defective alloy-steel castings. Defects in alloy-steel castings may be repaired by arc or gas welding in accordance with the requirements of § 57.15-5, provided the preheat and postheat employed are satisfactory for the material to be welded and process approval tests are conducted. The heat treatment and process approval tests shall be acceptable to the Commandant.

§ 57.15-15 Furnace repairs. (a) Where corrugated or plain furnaces or flues are distorted to a difference of 1½ inches in diameter (that is, 1½-inch deviation from a true circle), they shall be forced back to a true circular shape, and the Officer in Charge, Marine Inspection, may require strong-backs or other acceptable means of support to hold the furnace from future collapse if in his opinion such action is necessary.

(b) Where the distortion is in excess of 1½ inches, the furnace shall be forced back to practically a true circle and/or adequately stayed as found necessary in the judgment of the inspector.

(c) Where the distortion does not exceed 1½ inches it will not be necessary to force the furnace back to a true circle if the working pressure is reduced in the ratio of 1½ percent for each ¼ of an inch that the furnace is out of round. However, if the maximum distortion does not exceed 1 inch and the length of the distorted area is not more than three corrugations, or if the maximum distortion does not exceed ¾ inch for a greater length of the distorted area, the repairs or reduction in pressure will not be required unless considered necessary by the inspector.

(d) When it becomes necessary to rivet a patch to a furnace or other part of the heating surface, the riveted patch shall be placed on the water side of the plate in order not to form a pocket in which sediment may collect.

(e) Furnace crowns which have become distorted, not in excess of the limitations provided in paragraph (c), may be repaired by pumping back the distorted section to as nearly a true circle as possible and reinforcing the same by means of a ring, arc or gas welded to the distorted corrugation as shown in figure 57.15-5 (e), the welding to be done by qualified welding operators using acceptable welding rods or electrodes in accordance with § 56.01-20 of this subchapter.

§ 57.15-20 Stayed furnaces and combustion chambers. (a) Where the plate forming the walls of stayed furnaces or combustion chambers becomes bulged between staybolts, repairs may be made by inserting an additional staybolt in the center of such space supported by the four staybolts.

(b) Where it is desired to apply a riveted patch to the wall of a stayed furnace or combustion chamber, the defective portion of the plate shall be cut away until solid material is reached, the patch shall be riveted on the water side, and the staybolts renewed, and extended through the new plate.

§ 57.15-25 Renewal of wrapper sheets. Wrapper sheets in combustion chambers

of fire-tube boilers may be renewed in whole or in part as follows:

(a) The wrapper sheet shall be cut away between two rows of staybolts where the thickness of the material is approximately the same as in the original construction.

(b) Where the edges of the plate are riveted to the lower tube sheet and the back connection head, the plate shall be removed by cutting out the rivets.

(c) Where the plate has been cut off the edges shall be chipped or ground to a bevel to insure good penetration of the weld, and the ends of the new plate shall be treated in the same manner.

(d) The new plate shall be riveted to the flanges of the tube sheets and back connection heads, and the ends may be butt welded, after which the staybolts shall be renewed.

§ 57.15-30 *Bagged or blistered shell plates.* (a) When the shell plates of cylindrical boilers which are exposed to the radiant heat of the fire become

bagged or blistered, it shall be the duty of the chief engineer in charge of the vessel to notify the Officer in Charge, Marine Inspection, for examination before raising steam on the boiler.

(b) Where the shell plate is bagged due to overheating, the Officer in Charge, Marine Inspection, may, if in his judgment it is practicable, permit the same to be driven back to its original position.

(c) Where the shell plate has blistered, bagged, or bulged to such an extent that there is an appreciable thinning of the plate, the Officer in Charge, Marine Inspection, shall require the defective portion to be cut away and the shell repaired by fitting a patch of steel plate conforming to the requirements of subpart 51.04 in place of the defective portion, care being taken that the riveting schedule of the patch is so arranged as to give the plate sufficient strength to withstand the stress placed on it in service.

SUBPART 57.20—OFFICIAL FORMS

§ 57.20-1 Scope. This subpart includes descriptions of the official forms required to be submitted to the Coast Guard by the regulations in this subchapter. Copies of the forms may be obtained upon request from the nearest Officer in Charge, Marine Inspection, or the Commandant (MMT), United States Coast Guard, Washington 25, D. C.

§ 57.20-5 *Form CG 2935; boiler data report; manufacturer's certification.* (a) The manufacturer of each boiler to be used on vessels subject to inspection by the Coast Guard shall submit to the Officer in Charge, Marine Inspection, having jurisdiction over the district in which the manufacturer's plant is located, a data report in triplicate on form CG 2935 together with a certification that the data is correct and that the material and fabrication of this boiler comply with all the regulations applicable thereto.

(b) Form CG 2935 contains the following information:

- (1) Name and address of fabricator.
- (2) Name of ship or shipyard to which boiler will be sent.
- (3) Type of boiler and construction.
- (4) U. S. C. G. No. and manufacturer's serial No.
- (5) Drawing numbers, by whom approved in Coast Guard, and date.
- (6) Material identification for shell and heads.
- (7) Maximum allowable pressure and hydrostatic test pressure.

§ 57.20-10 *Form CG 2936; unfired pressure vessel data report; manufacturer's certification.* (a) The manufacturer of unfired pressure vessels to be used on vessels subject to inspection by the Coast Guard shall submit to the Officer in Charge, Marine Inspection, having jurisdiction over the district in which the manufacturer's plant is located, a data report in triplicate on form CG 2936 together with a certification that the data is correct and that the material and fabrication comply with all the regulations applicable thereto.

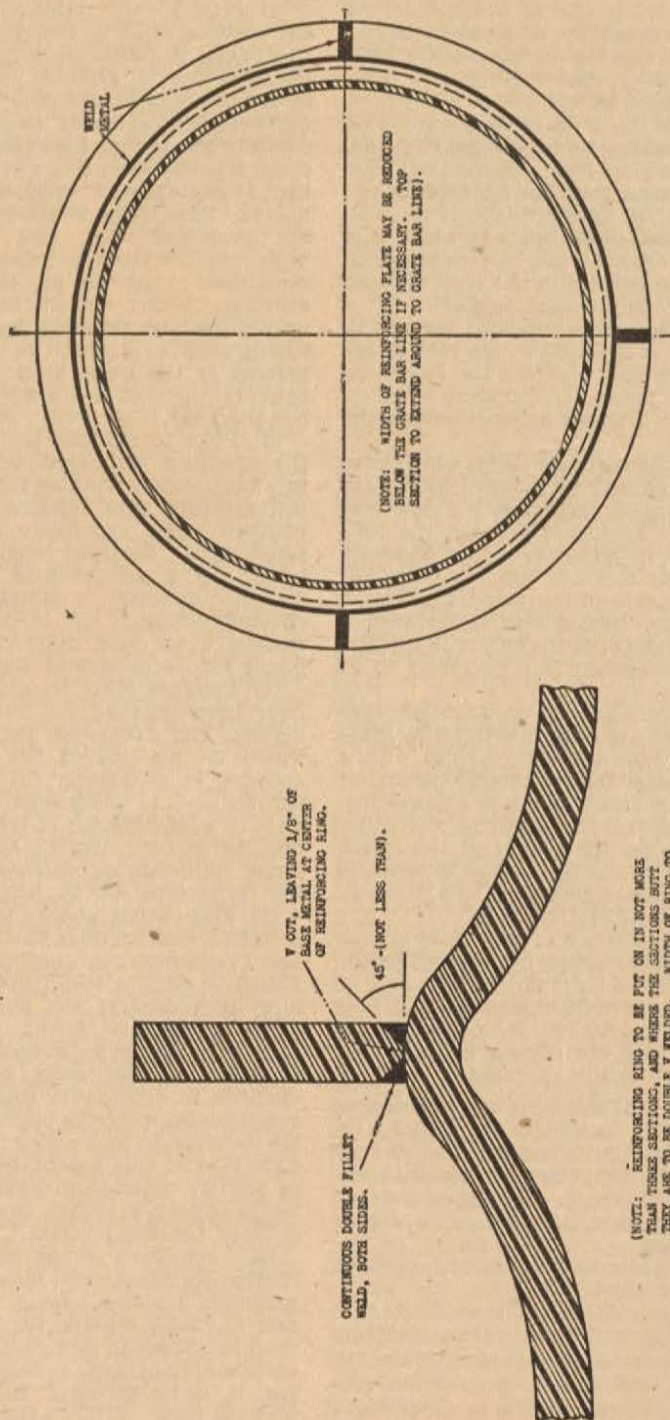


FIGURE 57.15-15 (e)—Approved method of reinforcing furnace crowns by means of arc or gas welding.

(b) Form CG 2936 contains the following information:

- (1) Name and address of fabricator.
- (2) Name of ship or shipyard to which pressure vessel will be sent.
- (3) Type of unfired pressure vessel.
- (4) Marine inspection office number and manufacturer's number.
- (5) Drawing numbers, by whom approved in Coast Guard, and date.
- (6) Shell material and manufacturer.
- (7) Head material and manufacturer.
- (8) Maximum allowable pressure for shell and tubes and hydrostatic test pressure.
- (9) Type of construction and if stress-relieved.

§ 57.20-15 *Form CG 935A; affidavit of manufacturer of class B material or appliances.* The manufacturer of either class B materials or appliances for use on vessels subject to inspection by the Coast Guard and to the regulations in this subchapter shall submit to the Commandant (MMT), United States Coast Guard, Washington 25, D. C., an affidavit on form CG 935A certifying that certain product(s) of his manufacture furnished directly or through agents or dealers for use on vessels subject to inspection by the Coast Guard will comply with all regulations applicable thereto.

§ 57.20-20 *Form CG 945; report of chief engineer on fusible plugs inserted in boiler.* (a) The form CG 945 shall be used by the chief engineer to report the renewal of fusible plugs. (See § 57.10-20 (c).) The completed form CG 945 shall be sent to the Officer in Charge, Marine Inspection, in the district in which the last annual inspection was made. This report shall be rendered immediately after each annual inspection to cover fusible plugs renewed at the annual inspection and also whenever fusible plugs are renewed at other times.

(b) The report made on form CG 945 shall set forth the following:

- (1) Name of vessel and gross tonnage thereof.
- (2) Date fusible plug or plugs were inserted in boiler or boilers.
- (3) Number of boilers in vessel.
- (4) Description of boiler or boilers in the vessel (manufacturer's number on boiler, by location or otherwise, so that boiler may be identified; and, if a fusible plug is inserted in the crown sheet of a separate combustion chamber, the location of combustion chamber should be stated).
- (5) Name of the manufacturer of the fusible plugs.
- (6) Manufacturer's mark on casing of fusible plugs.
- (7) Heat number on both ends of filling of fusible plugs.
- (8) Diameter of filling at smaller end of fusible plugs.
- (9) Steam pressure allowed for boiler by last certificate of inspection.
- (10) Number of such fusible plugs inserted.
- (11) Length of time that removed plugs have been in service.
- (12) If the length of time that a fusible plug has been installed in a boiler exceeds 6 months, state the length of time that the vessel has been out of service

and boiler not in use since the removed plug was placed in boiler.

(13) Under "Remarks" such other information as may be of interest and value to the inspectors.

SUBPART 57.25—FUSIBLE PLUGS

§ 57.25-1 *Definitions.*—(a) *Water side plugs.* Water side plugs are fusible plugs which are inserted from the water side of the plate or tube.

(b) *Fire side plugs.* Fire side plugs are fusible plugs inserted from the fire side of the plate, flue, or tube to which they are attached.

§ 57.25-5 *Detail requirements.* Fusible plugs intended for use in boilers installed on vessels subject to inspection by the Coast Guard shall comply with the following requirements:

(a) *Casings.* The casings of fusible plugs shall be designed as in figure 57.25-5 (a), and shall be made of bronze in accordance with the requirements of subpart 51.76 for grade B or C. The bore of the casing shall be tapered continuously and evenly from the water end of the plug to within 1 inch of the fire end where fire side plugs are used, and to within $\frac{1}{2}$ inch of the fire end where water side plugs are used, at which point the diameter of the bore shall be not less than $\frac{3}{8}$ inch and the tapered section shall be without recess, thread, or cavity from the water end. From the point where the bore is $\frac{3}{8}$ inch, the taper shall be reversed so as to leave an opening on the fire side of not less than $\frac{1}{16}$ inch. The bore of the plug shall be filled from the water end to the point of least diameter of the bore with a tin filling which shall be carefully alloyed to the casing.

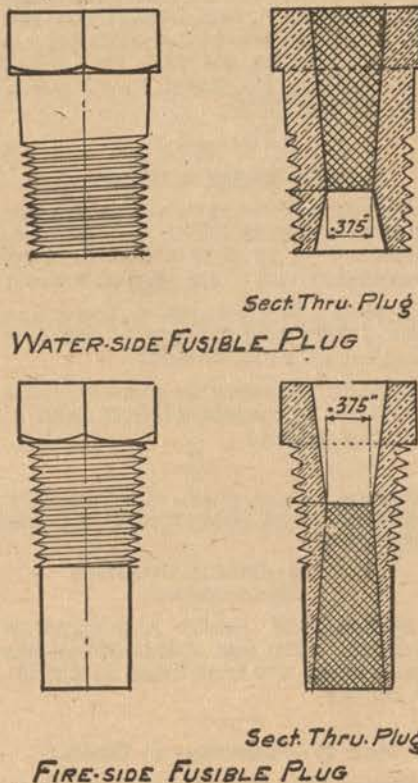


FIGURE 57.25-5 (a)—Approved types of fusible plugs with standard pipe threads.

The over-all length of the fire side plugs shall be not less than $2\frac{1}{2}$ inches, and that of the water side plugs not less than 2 inches.

(b) *Fillings.* Fusible plugs shall be filled from the water end to the point of least diameter of the casing with a filling of tin, as follows:

	Percent
Pure tin.....	minimum... 99.8
Copper.....	maximum... 0.5
Lead.....	do..... 0.1
Total impurities.....	do..... 0.7

§ 57.25-10 *Tests.* Fusible plug manufacturers who desire to have their product accepted for marine service shall submit samples from each heat to the Commandant for test, as follows:

(a) One sample plug shall be furnished for chemical analysis plus an additional plug for physical test taken at random from each heat for examination and test for each 500 plugs or fraction thereof.

(b) The samples furnished shall bear the same number for any one heat and shall be representative of the heat from which the sample was poured.

(c) The fillings shall be tested for tightness by striking the small end three blows equivalent to 2 foot-pounds of energy per blow. If these tests reveal a loose filling, the entire lot of plugs shall be rejected.

(d) The filling of one test plug from each lot shall then be melted out of the casing by a ring burner and caught in a clean graphite crucible to be used as a sample for chemical analysis. The inside of the casing shall show that the tin filling was properly alloyed to the casing. Evidence of improper or incomplete alloying will cause rejection of the entire lot represented.

§ 57.25-15 *Rejections.* The Coast Guard reserves the right to reject any lot of fusible plugs for failure to conform to these requirements, or for any other defect which might render them unsafe or inoperative.

§ 57.25-20 *Marking of fusible plugs.* The name or initials of the manufacturer shall be stamped on the face of the casing for identification, and all plugs shall be numbered in accordance with the number of the heat from which the plugs were filled. For instance, the first pouring shall be number 1, and all plugs filled from this heat shall be numbered 1; the next pouring shall be number 2, and all the plugs filled from this heat shall be numbered 2; etc. The heat number shall be plainly stamped on the large end of the filling. When more than 500 plugs are poured from one heat, the plugs shall be subdivided into lots of not more than 500. When the heat is subdivided, the number of the lot shall also be plainly stamped on the large end of the filling. The first lot of the heat shall be numbered 1, the next lot 2, etc. The heat and lot numbers shall be not less than $\frac{1}{12}$ inch in height.

§ 57.25-25 *Forwarding of samples.* In transmitting samples of fusible plugs to the Commandant, the fusible plugs and the letters of transmittal shall be addressed as follows: "The Commandant (MMT), United States Coast Guard,

Washington 25, D. C." and one letter of transmittal shall be required for each heat, in which the following information shall be stated:

- (a) Number of heat.
- (b) Number of fusible plugs manufactured from one heat.
- (c) Number of samples of fusible plugs from one heat forwarded.
- (d) Name of manufacturer or initials on casing of plug.

PART 58—BOILER PLATE; BOILERS AND ATTACHMENTS

Section 58.25 *Welding and reinforcing* is amended by changing the reference to "§ 57.21-4" to "§ 57.15-1 of this subchapter," which appears at the end of the last undesignated paragraph.

Subchapter G—Ocean and Coastwise: General Rules and Regulations

PART 62—SPECIAL OPERATING REQUIREMENTS

Section 62.61 *Fusible plug report* is canceled. (The text of this section has been revised and transferred to § 57.20-20, *supra*.)

PART 63—INSPECTION OF VESSELS

Section 63.11 is amended by adding a new paragraph (g), which was formerly published as § 54.18-7, and which reads as follows:

§ 63.11 *Specifications covering types of voice tubes and telephones.* * * *

(g) *Engine-room signals.* Signals between engine room and pilothouse, whether they be telegraph, bell, whistle, telephone, or voice tubes, shall be examined and tested at each inspection. (R. S. 4405, 4418, 4426, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 375, 392, 404, 367, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.)

PART 64—DUTIES OF INSPECTORS

Part 64 is amended by adding two new §§ 64.21 and 64.22, which were formerly published as §§ 54.18-6 and 54.18-10, respectively, and which read as follows:

§ 64.21 *Fire-prevention inspection.* (a) When inspecting oil-burning vessels, either internal-combustion type or steam-driven type, the inspector shall examine the tank tops and bilges in the fireroom and engine room to see that there is no accumulation of oil which might create a fire hazard.

(b) The examination of the fire-fighting equipment shall be made by inspectors. This applies to fire pumps, hose, chemical fire extinguishers, axes, and steam or gas smothering lines to cargo holds and compartments.

(c) The inspectors shall examine the fire-fighting equipment provided for the fireroom and engine room to ascertain if it conforms to the regulations in this subchapter and that it is in good condition for immediate use.

(d) At the annual inspection or periodical reinspections, the inspectors

shall examine the water-sprinkling system, when fitted, to ascertain if it is in good condition and ready for immediate use. (R. S. 4405, 4426, 4453, 49 Stat. 1544, 54 Stat. 346, 1028, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 404, 435, 463a, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.)

§ 64.22 *Inspection of quarters.* It shall be the duty of the inspector to examine passengers' and crews' quarters to see that they are kept in a sanitary condition and to report any deficiencies. (R. S. 4405, 4417, 49 Stat. 1544, 1935, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 391, 660a, 1333; 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.)

Subchapter H—Great Lakes: General Rules and Regulations

PART 78—SPECIAL OPERATING REQUIREMENTS

Section 78.54 *Fusible plug report* is canceled. (The text of this section has been revised and transferred to § 57.20-20, *supra*.)

PART 79—INSPECTION OF VESSELS

Section 79.12 is amended by adding a new paragraph (g), which was formerly published as § 54.18-7, and which reads as follows:

§ 79.12 *Specifications covering types of voice tubes and telephones.* * * *

(g) *Engine-room signals.* Signals between engine room and pilothouse, whether they be telegraph, bell, whistle, telephone, or voice tubes, shall be examined and tested at each inspection. (R. S. 4405, 4418, 4426, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 375, 392, 404, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.)

PART 83—DUTIES OF INSPECTORS

Part 83 is amended by adding two new §§ 83.21 and 83.22, which were formerly published as §§ 54.18-6 and 54.18-10, respectively, and which read as follows:

§ 83.21 *Fire-prevention inspection.* (See § 64.21 of this chapter, which is identical with this section.)

§ 83.22 *Inspection of quarters.* (See § 64.22 of this chapter, which is identical with this section.)

Subchapter I—Bays, Sounds, and Lakes Other Than the Great Lakes: General Rules and Regulations

PART 96—SPECIAL OPERATING REQUIREMENTS

Section 96.53 *Fusible plug report* is canceled. (The text of this section has been revised and transferred to § 57.20-20, *supra*.)

PART 97—INSPECTION OF VESSELS

Section 97.14 is amended by adding a new paragraph (g), which was formerly

published as § 54.18-7, and which reads as follows:

§ 97.14 *Specifications covering types of voice tubes and telephones.* * * *

(g) *Engine-room signals.* Signals between engine room and pilothouse, whether they be telegraph, bell, whistle, telephone, or voice tubes, shall be examined and tested at each inspection. (R. S. 4405, 4418, 4426, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 375, 392, 404, 1333, 50 U. S. C. 1275; and sec. 101, Reorg. Plan No. 3 of 1946; 11 F. R. 7875.)

PART 101—DUTIES OF INSPECTORS

Part 101 is amended by adding two new §§ 101.21 and 101.22, which were formerly published as §§ 54.18-6 and 54.18-10, respectively, and which read as follows:

§ 101.21 *Fire-prevention inspection.* (See § 64.21 of this chapter, which is identical with this section.)

§ 101.22 *Inspection of quarters.* (See § 64.22 of this chapter, which is identical with this section.)

Subchapter J—Rivers: General Rules and Regulations

PART 115—SPECIAL OPERATING REQUIREMENTS

Section 115.46 *Fusible plug report* is canceled. (The text of this section has been revised and transferred to § 57.20-20, *supra*.)

PART 116—INSPECTION OF VESSELS

Section 116.10 is amended by adding a new paragraph (g), which was formerly published as § 54.18-7, and which reads as follows:

§ 116.10 *Specifications covering types of voice tubes and telephones.* (See § 97.14 of this chapter, as amended, which is identical with this section.)

PART 120—DUTIES OF INSPECTORS

Part 120 is amended by adding two new §§ 120.21 and 120.22, which were formerly published as §§ 54.18-6 and 54.18-10, respectively, and which read as follows:

§ 120.21 *Fire-prevention inspection.* (See § 64.21 of this chapter, which is identical with this section.)

§ 120.22 *Inspection of quarters.* (See § 64.22 of this chapter, which is identical with this section.)

Dated: March 23, 1948.

[SEAL] J. F. FARLEY,
Admiral, U. S. Coast Guard,
Commandant.

[F. R. Doc. 48-2817; Filed, Mar. 30, 1948;
8:50 a. m.]

TITLE 43—PUBLIC LANDS: INTERIOR

Chapter I—Bureau of Land Management, Department of the Interior

Appendix—Public Land Orders

[Public Land Order 459]

COLORADO

WITHDRAWING PUBLIC LANDS AND RESERVED MINERALS IN PATENTED LANDS FOR USE OF UNITED STATES ATOMIC ENERGY COMMISSION

By virtue of the authority vested in the President and pursuant to Executive Order No. 9337 of April 24, 1943, it is ordered as follows:

Subject to valid existing rights and existing withdrawals, the public lands and the minerals reserved to the United States in the patented lands in the following-described areas in Colorado are hereby withdrawn from all forms of appropriation under the public-land laws, including the mining laws but not the mineral-leasing laws, and reserved for the use of the United States Atomic Energy Commission:

NEW MEXICO PRINCIPAL MERIDIAN

- T. 46 N., R. 17 W.,
SECS. 1, 2, and 12.
- T. 47 N., R. 17 W.,
Sec. 4, lots 3, 4, S½NW¼, and SW¼;
SECS. 5 and 6;
Sec. 7, NE¼;
Sec. 8, SECS. 17 to 21 inclusive, SECS. 27, 28,
29 and 34;
Sec. 35, W½.
- T. 48 N., R. 17 W.,
Sec. 29, S½;
Sec. 30, S½;
SECS. 31, 32, and 33.
- T. 43 N., R. 18 W., partly unsurveyed, SECS.
18, 19, 20, and SECS. 28 to 33 inclusive.
- T. 43 N., R. 19 W., SECS. 4, 5, and 8; Sec. 9,
W½; SECS. 10 and 11; Sec. 13, E½; SECS.
14 to 18 inclusive; Sec. 20, E½; SECS. 21 to
25 inclusive; Sec. 28; Sec. 29, E½.
- T. 44 N., R. 19 W., Sec. 19, S½; SECS. 22 and
23; Sec. 26, N½; SECS. 27 to 33 inclusive;
Sec. 34, N½.
- T. 44 N., R. 20 W., SECS. 23 to 26 inclusive;
SECS. 35 and 36.

The areas described, including both public and non-public lands, aggregate 39,951.68 acres.

C. GIRARD DAVIDSON,
Assistant Secretary of the Interior.

MARCH 25, 1948.

[F. R. Doc. 48-2787; Filed, Mar. 30, 1948;
8:45 a. m.]

No. 63—14

TITLE 49—TRANSPORTATION AND RAILROADS

Chapter I—Interstate Commerce Commission

[S. O. 624, Amdt. 10]

PART 95—CAR SERVICE

MOVEMENT OF GRAIN TO TERMINAL ELEVATORS BY PERMIT

At a session of the Interstate Commerce Commission, Division 3, held at its office in Washington, D. C., on the 24th day of March A. D. 1948.

Upon further consideration of Service Order No. 624 (11 F. R. 12183), as amended (11 F. R. 13792, 14272; 12 F. R. 48, 775, 1420, 4185, 4516, 6088), and good cause appearing thereof, *It is ordered, That:*

Section 95.624 *Movement of grain to terminal elevators by permit*, of Service Order No. 624, as amended, be, and it is hereby further amended by substituting the following paragraph (e) for paragraph (e) thereof.

(e) *Expiration date.* This section shall expire at 7:00 a. m., September 30, 1948, unless otherwise modified, changed, suspended or annulled by order of this Commission.

It is further ordered, That this amendment shall become effective at 12:01 a. m., March 31, 1948; that a copy of this order be served upon the Association of American Railroads, Car Service Division, as agent of all railroads subscribing to the car service and per diem agreement under the terms of that agreement; and that notice of this order be given to the general public by depositing a copy in the office of the Secretary of the Commission at Washington, D. C., and by filing it with the Director, Division of the Federal Register.

(Sec. 1, 24 Stat. 379, as amended; 49 U. S. C. 1 (10)-(17))

By the Commission, Division 3.

[SEAL] W. P. BARTEL,
Secretary.

[F. R. Doc. 48-2811; Filed, Mar. 30, 1948;
8:49 a. m.]

Chapter II—Office of Defense Transportation

PART 500—CONSERVATION OF RAIL EQUIPMENT

SHIPMENTS OF NEW FRESH HARVESTED ONIONS

CROSS REFERENCE: For an exception to the provisions of § 500.72, see Part 520 of this chapter, *infra*.

[Gen. Permit ODT 18A, Rev. 38]

PART 520—CONSERVATION OF RAIL EQUIP- MENT; EXCEPTIONS, PERMITS AND SPECIAL DIRECTIONS

SHIPMENTS OF NEW FRESH HARVESTED ONIONS

Pursuant to Title III of the Second War Powers Act, 1942, as amended, Executive Order 8989, as amended, Executive Order 9729, as amended, Executive Order 9919, and General Order ODT 18A, Revised, as amended, it is hereby ordered, that:

§ 520.539 *Shipments of new fresh harvested onions.* Notwithstanding the restrictions contained in § 500.72 of General Order ODT 18A, Revised, as amended (11 F. R. 8229, 8829, 10616, 13320, 14172; 12 F. R. 1034, 2386), or in Item 400 of Special Direction ODT 18A-2A, as amended (9 F. R. 118, 4247, 13008; 10 F. R. 2523, 3470, 14906; 11 F. R. 1358, 13793, 14114; 12 F. R. 8025), any person may offer for transportation and any rail carrier may accept for transportation at point of origin, forward from point of origin, or load and forward from point of origin, any carload freight consisting of new fresh harvested onions:

(a) When the origin point of any such freight is any point or place within the United States except a point or place in the States of Georgia or Texas, and the quantity loaded in each car is not less than 30,000 pounds;

(b) When the origin point of any such freight is a point or place in the States of Georgia or Texas, and the quantity loaded in each car is not less than 25,000 pounds.

This General Permit ODT 18A, Revised-38, shall become effective March 29, 1948 and shall expire September 30, 1948.

(54 Stat. 676, 55 Stat. 236, 56 Stat. 177, 58 Stat. 827, 59 Stat. 658, 60 Stat. 345, 61 Stat. 34, 321, Pub. Law 395, 80th Cong.; 50 U. S. C. App. Sup. 633, 645, 1152; E. O. 8989, Dec. 18, 1941, 6 F. R. 6725; E. O. 9389, Oct. 18, 1943, 8 F. R. 14183; E. O. 9729, May 23, 1946, 11 F. R. 5641; E. O. 9919, Jan. 3, 1948, 13 F. R. 59)

Issued at Washington, D. C. this 26th day of March 1948.

J. M. JOHNSON,
Director,

Office of Defense Transportation.

[F. R. Doc. 48-2819; Filed, Mar. 30, 1948;
8:50 a. m.]

PROPOSED RULE MAKING

DEPARTMENT OF AGRICULTURE

Production and Marketing Administration

[7 CFR, Part 511]

U. S. STANDARDS FOR FRESH PLUMS AND PRUNES

NOTICE OF PROPOSED RULE MAKING

Notice is hereby given that the United States Department of Agriculture is considering the issuance of amendments, as hereinafter proposed, to the United States Standards for plums and prunes (fresh), 12 F. R. 2305, under the authority contained in the Department of Agriculture Appropriation Act for 1948 (Pub. Law 266, 80th Cong., 1st Sess., approved July 30, 1947). The amendments are proposed to become effective during the month of May 1948. The proposed amendments are as follows:

1. Delete that part of subparagraph (4) of § 51.360 (e) which precedes subdivision (i) and substitute, in lieu thereof, the following:

§ 51.360 *Plums and prunes.* * * *
(e) *Definitions.* * * *

(4) "Damage" means any injury or defect which materially affects the appearance, or edible or shipping quality of the fruit. Internal growth cracks, cavities or gum spots are not considered as damage. Any one of the following defects, or any combination of defects, the seriousness of which exceeds the maximum

allowed for any one defect, shall be considered as damage:

2. Delete subdivision (iii) of § 51.360 (e) (4) and substitute, in lieu thereof, the following:

(iii) External growth cracks, when there are more than one on a fruit, or when any growth crack is deep, not well healed, or more than one-fourth inch in length.

3. Delete subdivision (vii) of § 51.360 (e) (4) and substitute, in lieu thereof, the following:

(vii) Drought spots or external gum spots which are more than one-fourth of an inch in diameter.

4. Delete subdivision (iii) of § 51.360 (e) (9) and substitute, in lieu thereof, the following:

(iii) External growth cracks which are not well healed, or which are more than $\frac{3}{16}$ inch in depth, or more than one-half inch in length.

5. Delete subdivision (vii) of § 51.360 (e) (9) and substitute, in lieu thereof, the following:

(vii) Drought spots or external gum spots which aggregate more than one-half inch in diameter.

All persons who desire to submit written data, views, or arguments for consideration in connection with the proposed amendments shall file the same in quadruplicate with the Hearing Clerk, Room

1844, South Building, United States Department of Agriculture, Washington, D. C. not later than 5:30 p. m. e. s. t. on the 20th day after the publication of this notice in the FEDERAL REGISTER.

Done at Washington, D. C., the 26th day of March 1948.

[SEAL] F. R. BURKE,
Acting Assistant Administrator,
Production and Marketing
Administration.

[F. R. Doc. 48-2858; Filed, Mar. 30, 1948;
8:51 a. m.]

[7 CFR, Ch. IX]

HANDLING OF IRISH POTATOES GROWN IN SOUTHEASTERN STATES

NOTICE OF RECOMMENDED DECISION AND OPPORTUNITY TO FILE WRITTEN EXCEPTIONS WITH RESPECT TO PROPOSED MARKETING AGREEMENT AND ORDER

Correction

In Federal Register Document 48-2572, appearing at page 1510 of the issue for Tuesday, March 23, 1948, the following changes should be made:

In the first paragraph, the reference to "Agricultural Marketing Act of 1937" should read "Agricultural Marketing Agreement Act of 1937."

In paragraph (3) of the "Preliminary statement," subdivision (b) should read: "(b) terms of office".

NOTICES

DEPARTMENT OF THE NAVY

[No. 9 (c)]

LIGHT CRUISERS CL-55 CLASS

CERTIFICATE OF SECRETARY OF NAVY

Whereas, the act of December 3, 1945 (Public Law 239, 79th Congress) provides that any requirement as to the number, position, range of visibility or arc of visibility of navigation lights, required to be displayed by naval vessels under acts of Congress, as enumerated in said act of December 3, 1945, shall not apply to any vessel of the Navy where the Secretary of the Navy shall find or certify that, by reason of special construction, it is not possible with respect to such vessel or class of vessels to comply with statutory requirements as to the number, position, range of visibility or arc of visibility of navigation lights; and

Whereas, a study of the arrangement and position of the navigation lights of that type of naval vessels known as Light Cruisers, CL-55 Class, has been made in the Navy Department and, as a result of such study, it has been determined that because of their special construction it is not possible for Light Cruisers, CL-55

Class, to comply with the requirements of the statutes enumerated in said act of December 3, 1945;

Now, therefore, I, John L. Sullivan, Secretary of the Navy, as a result of the aforesaid study do hereby find and certify that the type of naval vessels known as Light Cruisers CL-55 Class, are naval vessels of special construction and that on such vessels, with respect to the position of the additional white light (commonly termed the range light), it is not possible to comply with the requirements of the statutes enumerated in the act of December 3, 1945. Further, I do find and certify that it is feasible to locate the said additional white light (commonly termed the range light), if such light is installed, forward of the masthead light in such position that the said additional white light and the masthead light shall be in line with the keel and the after light shall be at least fifteen feet higher than the forward light and the vertical distance between the two lights shall be less than the horizontal distance. I further direct that the aforesaid additional white light, if such light is installed, shall be located in the manner above described and I further

certify that such location constitutes compliance as closely with the applicable statutes as I hereby find to be feasible.

Dated at Washington, D. C., this 15th day of March A. D. 1948.

JOHN L. SULLIVAN,
Secretary of the Navy.

[F. R. Doc. 48-2798; Filed, Mar. 30, 1948;
9:01 a. m.]

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[1606472]

ALASKA

NOTICE OF FILING OF PLATS OF SURVEY ACCEPTED APRIL 29, 1946 AND MARCH 10, 1947 AND APRIL 30, 1946

MARCH 23, 1948.

Notice is given that the plats of survey of lands hereinafter described will be officially filed in the District Land Office, Anchorage, Alaska, effective at 10:00 a. m. on May 25, 1948. At that time the lands shall, subject to valid existing rights and the provisions of existing

withdrawals, become subject to application, petition, location, or selection as follows:

(a) *Ninety-day period for preference-right filings.* For a period of 90 days from May 25, 1948, to August 23, 1948, inclusive, the public lands affected by this notice shall be subject to (1) application under the homestead laws, or the small tract act of June 1, 1938 (52 Stat. 609, 43 U. S. C. sec. 682a), as amended, by qualified veterans of World War II, for whose service recognition is granted by the act of September 27, 1944 (58 Stat. 747, 43 U. S. C. secs. 279-283), subject to the requirements of applicable law, and (2) application under any applicable public-land law, based on prior existing valid settlement rights and preference rights conferred by existing laws or equitable claims subject to allowance and confirmation. Application by such veterans shall be subject to claims of the classes described in subdivision (2).

(b) *Twenty-day advance period for simultaneous preference-right filings.* For a period of 20 days from May 6, 1948, to May 25, 1948, inclusive, such veterans and persons claiming preference rights superior to those of such veterans, may present their applications, and all such applications, together with those presented at 10:00 a. m. on May 25, 1948, shall be treated as simultaneously filed.

(c) *Date for non-preference-right filings authorized by the public-land laws.* Commencing at 10:00 a. m. on August 24, 1948, any of the lands remaining unappropriated shall become subject to such application, petition, location, or selection by the public generally as may be authorized by the public-land laws.

(d) *Twenty-day advance period for simultaneous non-preference-right filings.* Applications by the general public may be presented during the 20-day period from August 5, 1948, to August 24, 1948, inclusive, and all such applications, together with those presented at 10:00 a. m. on August 24, 1948, shall be treated as simultaneously filed.

Veterans shall accompany their applications with certified copies of their certificates of discharge, or other satisfactory evidence of their military or naval service. Persons asserting preference rights, through settlement or otherwise, and those having equitable claims, shall accompany their applications by duly corroborated affidavits in support thereof, setting forth in detail all facts relevant to their claims.

Applications for these lands, which shall be filed in the District Land Office, Anchorage, Alaska, shall be acted upon in accordance with the regulations contained in § 295.8 of Title 43 of the Code of Federal Regulations (Circular No. 324, May 22, 1914, 43 L. D. 254), to the extent that such regulations are applicable. Applications under the homestead laws shall be governed by the regulations contained in Parts 65 and 66 of Title 43 of the Code of Federal Regulations and applications under the small tract act of June 1, 1938, shall be governed by the regulations contained in Part 257, of that title.

Inquiries concerning these lands shall be addressed to the Acting Manager, District Land Office, Anchorage, Alaska.

The lands affected by this notice are described as follows:

SEWARD MERIDIAN

T. 4 S., R. 12 W.,
Secs. 25 to 36, inclusive.
T. 5 S., R. 12 W.,
Secs. 1 to 12, inclusive;
Secs. 14 to 22, inclusive;
Secs. 29 and 30.
T. 4 S., R. 13 W.,
T. 4 S., R. 14 W.,
Secs. 1 to 17, inclusive;
Secs. 19 to 36, inclusive.

The area described aggregates 67,659.74 acres.

The character of the land is mostly rolling hills with occasional level tracts of swampy land supporting scattering to medium stands of timber and undergrowth.

THOS. C. HAVELL,
Assistant Director.

[F. R. Doc. 48-2788; Filed, Mar. 30, 1948;
8:45 a. m.]

[Misc. 1768933]

WYOMING

NOTICE OF FILING OF PLATS OF SURVEY
ACCEPTED JUNE 21, 1944

MARCH 23, 1948.

Notice is given that the plats of survey, including lands hereinafter described, will be officially filed in the District Land Office, Cheyenne, Wyoming, effective at 10:00 a. m. on May 25, 1948.

The lands affected by this notice are described as follows:

SIXTH PRINCIPAL MERIDIAN

T. 55 N., R. 104 W.
T. 51 N., R. 105 W.

The area described aggregates 45,651.09 acres.

All of the lands involved are within the limits of the Shoshone National Forest, the public lands therein having been withdrawn for forest purposes pursuant to Executive orders of May 22, 1902, January 29, 1905, July 1, 1908 and Executive Order No. 4486 of July 29, 1926 and by proclamation of March 2, 1907 and adjusted by Letter "E" (06579 Lander) and the act of May 4, 1927 (44 Stat. 1412).

The N $\frac{1}{2}$ sec. 4, all sec. 5, E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 6, NW $\frac{1}{4}$ sec. 7, T. 55 N., R. 104 W., 6th P. M., are included in Power Site Classification No. 353 approved June 7, 1944.

Any one having a valid settlement or other right to any of these lands initiated prior to the withdrawal of May 22, 1902, should assert the same within three months from the date on which the plat is officially filed by filing an application under appropriate public-land law setting forth all facts relevant thereto.

All inquiries relating to the lands should be addressed to the Acting Manager, District Land Office at Cheyenne, Wyoming.

THOS. C. HAVELL,
Assistant Director.

[F. R. Doc. 48-2789; Filed, Mar. 30, 1948;
8:45 a. m.]

[Misc. 1779020]

ALASKA

NOTICE OF FILING OF PLATS OF SURVEY
ACCEPTED DECEMBER 20, 1945

MARCH 23, 1948.

Notice is given that the plats of a re-survey and extension survey of lands hereinafter described will be officially filed in the District Land Office, Anchorage, Alaska, effective at 10:00 a. m. on May 25, 1948. At that time the lands shall, subject to valid existing rights and the provisions of existing withdrawals, become subject to application, petition, location, or selection as follows:

(a) *Ninety-day period for preference-right filings.* For a period of 90 days from May 25, 1948, to August 23, 1948, inclusive, the public lands affected by this notice shall be subject to (1) application under the homestead laws, or the small tract act of June 1, 1938 (52 Stat. 609, 43 U. S. C. sec. 682a), as amended, by qualified veterans of World War II, for whose service recognition is granted by the act of September 27, 1944 (58 Stat. 747, 43 U. S. C. secs. 279-283), subject to the requirements of applicable law, and (2) application under any applicable public-land law, based on prior existing valid settlement rights and preference rights conferred by existing laws or equitable claims subject to allowance and confirmation. Application by such veterans shall be subject to claims of the classes described in subdivision (2).

(b) *Twenty-day advance period for simultaneous preference-right filings.* For a period of 20 days from May 6, 1948, to May 25, 1948, inclusive, such veterans and persons claiming preference rights superior to those of such veterans, may present their applications, and all such applications, together with those presented at 10:00 a. m. on May 25, 1948 shall be treated as simultaneously filed.

(c) *Date for non-preference-right filings authorized by the public-land laws.* Commencing at 10:00 a. m. on August 24, 1948 any of the lands remaining unappropriated shall become subject to such application, petition, location, or selection by the public generally as may be authorized by the public-land laws.

(d) *Twenty-day advance period for simultaneous non-preference-right filings.* Applications by the general public may be presented during the 20-day period from August 5, 1948, to August 24, 1948, inclusive, and all such applications, together with those presented at 10:00 a. m. on August 24, 1948, shall be treated as simultaneously filed.

Veterans shall accompany their applications with certified copies of their certificates of discharge, or other satisfactory evidence of their military or naval service. Persons asserting preference rights, through settlement or otherwise, and those having equitable claims, shall accompany their applications by duly corroborated affidavits in support thereof, setting forth in detail all facts relevant to their claims.

Applications for these lands, which shall be filed in the District Land Office, Anchorage, Alaska, shall be acted upon in accordance with the regulations con-

tained in § 295.8 of Title 43 of the Code of Federal Regulations (Circular No. 324, May 22, 1914, 43 L. D. 254), to the extent that such regulations are applicable. Applications under the homestead laws shall be governed by the regulations contained in Parts 65 and 66 of Title 43 of the Code of Federal Regulations and applications under the small tract act of June 1, 1938, shall be governed by the regulations contained in Part 257 of that title.

Inquiries concerning these lands shall be addressed to the Acting Manager, District Land Office, Anchorage, Alaska.

The lands affected by this notice are described as follows:

SEWARD MERIDIAN

T. 6 S., R. 13 W.,
Sec. 35, lots 7 and 8;
Sec. 36, lot 2.
T. 7 S., R. 13 W.,
Sec. 1, lots 1, 2 and 3;
Sec. 2, lot 1.

The area described aggregates 168.37 acres.

Homer Spit is a narrow neck of land extending from the mainland southeasterly into Kachemak Bay. The land is moderately rolling, has a sandy soil with considerable gravel, and supports a growth of grass with occasional trees of small scrub pine.

THOS. C. HAVELL,
Assistant Director.

[F. R. Doc. 48-2790; Filed, Mar. 30, 1948;
8:45 a. m.]

[Misc. 1944464]

CALIFORNIA

NOTICE OF FILING OF PLATS OF SURVEY
ACCEPTED JULY 22, 1947

Notice is given that the plats of dependent resurvey of a portion of the townships and extension survey of lands hereinafter described will be officially filed in the District Land Office at Los Angeles, California, effective at 10:00 a. m. on May 25, 1948. At that time the lands shall, subject to valid existing rights and the provisions of existing withdrawals, become subject to application, petition, location, or selection as follows:

(a) *Ninety-day period for preference-right filings.* For a period of 90 days from May 25, 1948, to August 23, 1948, inclusive, the public lands affected by this notice shall be subject to (1) application under the homestead or the desert land laws, or the small tract act of June 1, 1938 (52 Stat. 609, 43 U. S. C. sec. 682a), as amended, by qualified veterans of World War II, for whose service recognition is granted by the act of September 27, 1944 (58 Stat. 747, 43 U. S. C. secs. 279-283), subject to the requirements of applicable law, and (2) application under any applicable public-land law, based on prior existing valid settlement rights and preference rights conferred by existing laws or equitable claims subject to allowance and confirmation. Application by such veterans shall be subject to

claims of the classes described in subdivision (2).

(b) *Twenty-day advance period for simultaneous preference-right filings.* For a period of 20 days from May 6, 1948, to May 25, 1948, inclusive, such veterans and persons claiming preference rights superior to those of such veterans, may present their applications, and all such applications, together with those presented at 10:00 a. m. on May 25, 1948, shall be treated as simultaneously filed.

(c) *Date for non-preference-right filings authorized by the public-land laws.* Commencing at 10:00 a. m. on August 24, 1948, any of the lands remaining unappropriated shall become subject to such application, petition, location, or selection by the public generally as may be authorized by the public-land laws.

(d) *Twenty-day advance period for simultaneous non-preference-right filings.* Applications by the general public may be presented during the 20-day period from August 5, 1948, to August 24, 1948, inclusive, and all such applications, together with those presented at 10:00 a. m. on August 24, 1948, shall be treated as simultaneously filed.

Veterans shall accompany their applications with certified copies of their certificates of discharge, or other satisfactory evidence of their military or naval service. Persons asserting preference rights, through settlement or otherwise, and those having equitable claims, shall accompany their applications by duly corroborated affidavits in support thereof, setting forth in detail all facts relevant to their claims.

Applications for these lands, which shall be filed in the District Land Office, Los Angeles, California, shall be acted upon in accordance with the regulations contained in § 295.8 of Title 43 of the Code of Federal Regulations (Circular No. 324, May 22, 1914, 43 L. D. 254), and Part 296 of that title, to the extent that such regulations are applicable. Applications under the homestead laws shall be governed by the regulations contained in Parts 166 to 170, inclusive, of Title 43 of the Code of Federal Regulations and applications under the desert land laws and the small tract act of June 1, 1938, shall be governed by the regulations contained in Parts 232 and 257, respectively, of that title.

Inquiries concerning these lands shall be addressed to the Acting Manager, District Land Office, Los Angeles, California.

The lands affected by this notice are described as follows:

SAN BERNARDINO MERIDIAN

T. 6 S., R. 1 E.,
Sec. 4, lots 3 and 4.
T. 16 S., R. 8 E.,
Sec. 36, lots 1 to 8, inclusive.

The area described aggregates 418.40 acres. These lands are mountainous in character.

THOS. C. HAVELL,
Assistant Director.

[F. R. Doc. 48-2791; Filed, Mar. 30, 1948;
8:46 a. m.]

[Misc. 1959261]

ARIZONA

NOTICE OF FILING OF PLATS OF DEPENDENT
RESURVEY AND EXTENSION SURVEY

MARCH 23, 1948.

Notice is given that the plats of extension survey of lands hereinafter described accepted August 5, 1947, will be officially filed in the District Land Office Phoenix, Arizona, effective at 10:00 a. m. on May 25, 1948. At that time the lands shall, subject to valid existing rights and the provisions of existing withdrawals, become subject to application, petition, location, or selection as follows:

(a) *Ninety-day period for preference-right filings.* For a period of 90 days from May 25, 1948, to August 23, 1948, inclusive, the public lands affected by this notice shall be subject to (1) application under the homestead or the desert land laws, or the small tract act of June 1, 1938 (52 Stat. 609, 43 U. S. C. sec. 682a), as amended, by qualified veterans of World War II, for whose service recognition is granted by the act of September 27, 1944 (58 Stat. 747, 43 U. S. C. secs. 279-283), subject to the requirements of applicable law, and (2) application under any applicable public-land law, based on prior existing valid settlement rights and preference rights conferred by existing laws or equitable claims subject to allowance and confirmation. Application by such veterans shall be subject to claims of the classes described in subdivision (2).

(b) *Twenty-day advance period for simultaneous preference-right filings.* For a period of 20 days from May 6, 1948, to May 25, 1948, inclusive, such veterans and persons claiming preference rights superior to those of such veterans, may present their applications, and all such applications, together with those presented at 10:00 a. m. on May 25, 1948, shall be treated as simultaneously filed.

(c) *Date for non-preference-right filings authorized by the public-land laws.* Commencing at 10:00 a. m. on August 24, 1948 any of the lands remaining unappropriated shall become subject to such application, petition, location, or selection by the public generally as may be authorized by the public-land laws.

(d) *Twenty-day advance period for simultaneous non-preference-right filings.* Applications by the general public may be presented during the 20-day period from August 5, 1948, to August 24, 1948, inclusive, and all such applications, together with those presented at 10:00 a. m. on August 24, 1948, shall be treated as simultaneously filed.

Veterans shall accompany their applications with certified copies of their certificates of discharge, or other satisfactory evidence of their military or naval service. Persons asserting preference rights, through settlement or otherwise, and those having equitable claims, shall accompany their applications by duly corroborated affidavits in support thereof, setting forth in detail all facts relevant to their claims.

Applications for these lands, which shall be filed in the District Land Office, Phoenix, Arizona, shall be acted upon in

accordance with the regulations contained in § 295.8 of Title 43 of the Code of Federal Regulations (Circular No. 324, May 22, 1914, 43 L. D. 254), and Part 296 of that title, to the extent that such regulations are applicable. Applications under the homestead laws shall be governed by the regulations contained in Parts 166 to 170, inclusive, of Title 43 of the Code of Federal Regulations and applications under the desert land laws and the small tract act of June 1, 1938, shall be governed by the regulations contained in Parts 232 and 257, respectively, of that title.

Inquiries concerning these lands shall be addressed to the Acting Manager, District Land Office, Phoenix, Arizona.

The lands affected by this notice are described as follows:

GILA AND SALT RIVER MERIDIAN

- T. 6 N., R. 1 E.,
 Sec. 1, lots 3 to 10, inclusive;
 Sec. 2;
 Sec. 3, lots 3 to 14, inclusive;
 Secs. 10 and 11;
 Sec. 12, lots 1 to 8, inclusive;
 Sec. 14, N $\frac{1}{2}$;
 Sec. 15, lots 1 to 4, inclusive, S $\frac{1}{2}$ N $\frac{1}{2}$.
 T. 7 N., R. 4 W.,
 Secs. 1 and 2;
 Sec. 3, lots 1 to 7, inclusive, SW $\frac{1}{4}$ NE $\frac{1}{4}$,
 S $\frac{1}{2}$ NW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$;
 Sec. 10, lots 1 to 8, inclusive;
 Secs. 11 and 12;
 Sec. 13, N $\frac{1}{2}$, SW $\frac{1}{4}$;
 Sec. 14, lots 1 to 4, inclusive, NW $\frac{1}{4}$, E $\frac{1}{2}$ E $\frac{1}{2}$.

The area described aggregates 7,915.74 acres.

These lands vary from rough rocky desert to mountainous in character.

THOS. C. HAVELL,
 Assistant Director.

[F. R. Doc. 48-2792; Filed, Mar. 30, 1948;
 8:46 a. m.]

[Misc. 2129044]

WISCONSIN

NOTICE OF FILING OF PLATS OF DEPENDENT
 RESURVEY AND EXTENSION SURVEY

MARCH 23, 1948.

Notice is given that the plat accepted November 6, 1947 of (1) dependent resurvey delineating the retracement and reestablishment of the boundaries of sections 7 and 8, T. 39 N., R. 18 E., Fourth Principal Meridian, Wisconsin, as shown upon the plat approved March 14, 1865, and (2) extension survey, including lands erroneously omitted from the original survey of the township and not shown upon the plat approved March 14, 1865, will be officially filed in the Bureau of Land Management, Washington 25, D. C., effective at 10:00 a. m. on May 25, 1948.

At that time the lands hereinafter described shall, subject to valid existing rights and the provisions of existing withdrawals, become subject to application, petition, location, or selection as follows:

(a) *Ninety-day period for preference-right filings.* For a period of 90 days from May 25, 1948, to August 23, 1948, inclusive, the public lands affected by this notice shall be subject to (1) application under the homestead laws, or the small tract act

of June 1, 1938 (52 Stat. 609, 43 U. S. C. sec. 682a), as amended, by qualified veterans of World War II, for whose service recognition is granted by the act of September 27, 1944 (58 Stat. 747, 43 U. S. C. secs. 279-283), subject to the requirements of applicable law, and (2) application under any applicable public-land law, based on prior existing valid settlement rights and preference rights conferred by existing laws or equitable claims subject to allowance and confirmation. Application by such veterans shall be subject to claims of the classes described in subdivision (2).

(b) *Twenty-day advance period for simultaneous preference-right filings.* For a period of 20 days from May 6, 1948, to May 25, 1948, inclusive, such veterans and persons claiming preference rights superior to those of such veterans, may present their applications, and all such applications, together with those presented at 10:00 a. m. on May 25, 1948 shall be treated as simultaneously filed.

(c) *Date for non-preference-right filings authorized by the public-land laws.* Commencing at 10:00 a. m. on August 24, 1948, any of the lands remaining unappropriated shall become subject to such application, petition, location, or selection by the public generally as may be authorized by the public-land laws.

(d) *Twenty-day advance period for simultaneous nonpreference-right filings.* Applications by the general public may be presented during the 20-day period from August 5, 1948, to August 24, 1948, inclusive, and all such applications, together with those presented at 10:00 a. m. on August 24, 1948, shall be treated as simultaneously filed.

Veterans shall accompany their applications with certified copies of their certificates of discharge, or other satisfactory evidence of their military or naval service. Persons asserting preference rights, through settlement or otherwise, and those having equitable claims, shall accompany their applications by duly corroborated affidavits in support thereof, setting forth in detail all facts relevant to their claims.

Applications for these lands, which shall be filed in the Bureau of Land Management, Washington 25, D. C., shall be acted upon in accordance with the regulations contained in § 295.8 of Title 43 of the Code of Federal Regulations (Circular No. 324, May 22, 1914, 43 L. D. 254), and Part 296 of that title, to the extent that such regulations are applicable. Applications under the homestead laws shall be governed by the regulations contained in Part 166 of Title 43 of the Code of Federal Regulations and applications under the small tract act of June 1, 1938, shall be governed by the regulations contained in Part 257 of that title.

Applications under the act of February 27, 1925 (43 Stat. 1013, 43 U. S. C. sec. 994), authorizing the Secretary of the Interior, in his discretion, to sell certain lands situated in the State of Wisconsin which were originally erroneously measured and shown upon the official plats as water covered areas, and affording a preference right to purchase to certain owners of adjoining lands and to certain citizens of the United States claiming

under color of title or as riparian owners, shall be governed by the regulations contained in Part 141 of the above-mentioned Title 43.

The lands affected by this notice are described as follows:

FLORENCE COUNTY

FOURTH PRINCIPAL MERIDIAN

- T. 39 N., R. 18 E.,
 Sec. 7, lots 7, 8, 9, and 10;
 Sec. 8, lots 7, 8, 9, 10, 11, 12, and 13.

The lands described aggregate 271.43 acres.

Lot 7, sec. 8 containing 10.45 acres, and lot 9, sec. 8 containing 40.93 acres, appear to be swamp and overflowed within the meaning of the act of September 28, 1850 (9 Stat. 519). Should the lands finally be determined to be swamp and overflowed in character they must be held to have inured to the State and any applications adverse to the State in conflict with swamp land claims will be governed by § 271.2 of Title 43 of the Code of Federal Regulations.

The character of the lands involved varies from high uplands with sandy banks along Lake Emily, to swampy areas bordering shallow portions of the lake.

Inquiries concerning these lands shall be addressed to the Director, Bureau of Land Management, Washington 25, D. C.

THOS. C. HAVELL,
 Assistant Director.

[F. R. Doc. 48-2793; Filed, Mar. 30, 1948;
 8:46 a. m.]

[Misc. 1527217]

NEVADA

NOTICE OF FILING OF PLAT OF SURVEY

MARCH 24, 1948.

Notice is given that the plat of survey of lands hereinafter described, accepted June 30, 1944, will be officially filed in the District Land Office, Carson City, Nevada, effective at 10:00 a. m. on May 26, 1948. At that time the lands shall, subject to valid existing rights and the provisions of existing withdrawals become subject to application, petition, location, or selection as follows:

(a) *Ninety-day period for preference-right filings.* For a period of 90 days from May 26, 1948, to August 24, 1948, inclusive, the public lands affected by this notice shall be subject to (1) application under the homestead or the desert land laws, or the small tract act of June 1, 1938 (52 Stat. 609, 43 U. S. C. sec. 682a), as amended, by qualified veterans of World War II, for whose service recognition is granted by the act of September 27, 1944 (58 Stat. 747, 43 U. S. C. secs. 279-283), subject to the requirements of applicable law, and (2) application under any applicable public-land law, based on prior existing valid settlement rights and preference rights conferred by existing laws or equitable claims subject to allowance and confirmation. Application by such veterans shall be subject to claims of the classes described in subdivision (2).

(b) *Twenty-day advance period for simultaneous preference-right filings.*

RULES AND REGULATIONS

For a period of 20 days from May 7, 1948, to May 26, 1948, inclusive, such veterans and persons claiming preference rights superior to those of such veterans, may present their applications, and all such applications, together with those presented at 10:00 a. m. on May 26, 1948, shall be treated as simultaneously filed.

(c) *Date for non-preference-right filings authorized by the public-land laws.* Commencing at 10:00 a. m. on August 25, 1948, any of the lands remaining unappropriated shall become subject to such application, petition, location, or selection by the public generally as may be authorized by the public-land laws.

(d) *Twenty-day advance period for simultaneous non-preference-right filings.* Applications by the general public may be presented during the 20-day period from August 6, 1948, to August 25, 1948, inclusive, and all such applications, together with those presented at 10:00 a. m. on August 25, 1948, shall be treated as simultaneously filed.

Veterans shall accompany their applications with certified copies of their certificates of discharge, or other satisfactory evidence of their military or naval service. Persons asserting preference rights, through settlement or otherwise, and those having equitable claims, shall accompany their applications by duly corroborated affidavits in support thereof, setting forth in detail all facts relevant to their claims.

Applications for these lands, which shall be filed in the District Land Office, Carson City, Nevada, shall be acted upon in accordance with the regulations contained in § 295.8 of Title 43 of the Code of Federal Regulations (Circular No. 324, May 22, 1914, 43 L. D. 254), and Part 296 of that title, to the extent that such regulations are applicable. Applications under the homestead laws shall be governed by the regulations contained in Parts 166 to 170, inclusive, of Title 43 of the Code of Federal Regulations and applications under the desert land laws and the small tract act of June 1, 1938, shall be governed by the regulations contained in Parts 232 and 257, respectively, of that title.

Inquiries concerning these lands shall be addressed to the Acting Manager, District Land Office, Carson City, Nevada.

The lands affected by this notice are described as follows:

MOUNT DIABLO MERIDIAN

T. 13 N., R. 32 E.,
Secs. 1 to 36, inclusive.

The area described aggregates 22,178.16 acres, exclusive of mining claim segregations.

The SE $\frac{1}{4}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, T. 13 N., R. 32 E., M. D. M. were included in Public Water Reserve of June 1, 1915, Interpretation No. 249 of November 30, 1938 as conformed January 17, 1945.

The land is rough and mountainous, having a dense stand of low desert type undergrowth and no timber.

THOS. C. HAVELL,
Assistant Director.

[F. R. Doc. 48-2794; Filed, Mar. 30, 1948;
8:47 a. m.]

[Misc. 1867979]

IDAHO

NOTICE OF FILING OF PLAT OF DEPENDENT
RESURVEY AND EXTENSION SURVEY

MARCH 24, 1948.

Notice is given that the plat of (1) dependent resurvey accepted September 26, 1945, of the south half of T. 18 N., R. 1 W., Boise Meridian, Idaho, delineating a retracement and reestablishment of the lines of the original survey as shown upon the plat approved April 17, 1893, and (2) extension survey, including lands hereinafter described of a portion of T. 18 N., R. 1 W., B. M., will be officially filed in the District Land Office, Blackfoot, Idaho, at 10:00 a. m. on May 26, 1948.

The lands affected by this notice are described as follows:

BOISE MERIDIAN

T. 18 N., R. 1 W.,
Secs. 1 to 18, inclusive.

The area described aggregates 11,519.88 acres.

All of the lands involved are within the exterior boundaries of the Payette National Forest, the public lands therein having been withdrawn for forest purposes pursuant to proclamations of May 10, 1906 and March 2, 1907 and Executive order of July 1, 1908 and Departmental order of March 18, 1944.

Anyone having a valid settlement or other right to any of these lands initiated prior to the withdrawal of May 10, 1906, should assert the same within three months from the date on which the plat is officially filed by filing an application under appropriate public-land law setting forth all facts relevant thereto.

All inquiries relating to these lands should be addressed to the Acting Manager, District Land Office, Blackfoot, Idaho.

THOS. C. HAVELL,
Assistant Director.

[F. R. Doc. 48-2795; Filed, Mar. 30, 1948;
8:48 a. m.]

[Misc. 1730268]

UTAH

NOTICE OF FILING OF PLAT OF EXTENSION
SURVEY AND INDEPENDENT RESURVEY

MARCH 24, 1948.

Notice is given that the plat of extension survey and independent resurvey including lands hereinafter described in T. 1 N., R. 10 E., Salt Lake Meridian, Utah, accepted May 17, 1945, will be officially filed in the District Land Office, Salt Lake City, Utah, effective at 10:00 a. m. on May 26, 1948.

The lands affected by this notice are described as follows:

SALT LAKE MERIDIAN

T. 1 N., R. 10 E.,
Secs. 1 to 36, inclusive.

The area described aggregates 23,240.81 acres.

All of the lands involved are within the limits of the Wasatch National Forest, the public lands therein having been

withdrawn for forest purposes pursuant to the third proclamation of January 16, 1906, fifth proclamation No. 1601 of July 9, 1921 and proclamation of January 31, 1933.

Anyone having a valid settlement or other right of any of these lands prior to the date of withdrawal of the lands should assert the same within three months from the date on which the plat was officially filed by filing an application under appropriate public-land law setting forth all facts relevant thereto.

All inquiries relating to these lands should be addressed to the Acting Manager, District Land Office, Salt Lake City, Utah.

THOS. C. HAVELL,
Assistant Director.

[F. R. Doc. 48-2796; Filed, Mar. 30, 1948;
8:48 a. m.]

DEPARTMENT OF COMMERCE

Office of the Secretary

PROCEDURE FOR ALLOCATIONS OF STEEL

VOLUNTARY AGREEMENTS

Procedure for allocations of steel through voluntary agreements under Public Law 395, 80th Congress. (a) The Secretary of Commerce, with the advice of the Advisory Committee of a steel consuming industry, will submit to the Steel Advisory Committee such program as he believes should receive consideration for the purposes of a voluntary agreement under section 2 of Public Law 395, 80th Congress, together with supporting data which shall include:

(1) The number of manufacturers represented,

(2) The specific products covered,

(3) The steel required, by product, by tons, and by end-use,

(4) A comparison of the proposed program with the production program, by product, of the steel consuming industry, for the years 1936-1939, inclusive, and the current production program,

(5) The reasons why an increase, if any, above present commitments by the steel industry is essential to the carrying out of the proposed program, and

(6) Evidence that the proposed program meets the declaration of purposes expressed in section 1 of Public Law 395.

(b) If it is recommended by the Steel Advisory Committee that the steel producing industry participate in the proposed program, the Secretary will forward it to the Director of the Iron and Steel Division of Office of Industry Cooperation for review with the Steel Products Advisory Committee (composed of representatives of the steel producing industry) as to the available supplies of the various items of steel products needed under the program. Subject to the conclusions reached upon such review, the program will be submitted to the Task Force (composed of representatives of the steel producing industry). It shall be the function of the task force to submit recommendations to the Secretary as to equitable allocation of tonnage, by products, among steel producers.

(c) Any such voluntary agreement shall include provision to the effect that steel consuming interests to which steel is made available under the agreement shall undertake that such steel shall not be used by them for any purpose other than that specified in such agreement.

(d) The Department of Commerce will attempt to obtain the agreement of all producers of steel and steel products to participate in any such agreement in their proportionate shares as determined in accordance with the provisions of such agreement. (Pub. Law 395, 80th Cong., E. O. 9919, Jan. 3, 1948, 13 F. R. 59)

Issued this 24th day of March 1948.

[SEAL] W. A. HARRIMAN,
Secretary of Commerce.

[F. R. Doc. 48-2797; Filed, Mar. 30, 1948;
8:48 a. m.]

FEDERAL COMMUNICATIONS COMMISSION

CENTRAL CONNECTICUT BROADCASTING CO.
ET AL.

NOTICE OF ORAL ARGUMENT

Beginning at 10:00 o'clock a. m. on Monday, April 5, 1948, the Commission will hear oral argument, in Room 6121 of the offices of the Commission, on the following matters, in the order indicated:

1st Argument

Docket No. 7567, B1-P-4505—Central Connecticut Broadcasting Co., New Britain, Conn.; 910 kc 5 kw unl, DA—night.

Docket No. 7873, B1-P-5006—The Hartford Times, Inc. Hartford, Conn. (WHTT); 910 kc 5 kw unl, DA—night and day.

Docket No. 7904, B1-P-5305—The New Britain Broadcasting Co., New Britain, Conn. (WKNB); 910 kc 5 kw unl, DA—night and day.

2d Argument

Docket No. 5968, B3-P-2553—Reporter Broadcasting Co., Abilene, Tex. (KRBC); 1470 kc 1 kw unl, DA—night.

Docket No. 6664, B3-P-3623—Calcasieu Broadcasting Co., Lake Charles, La. (KPLC); 1470 kc 5 kw unl, DA—night and day.

Docket No. 7371, B3-P-4410—KRIC, Inc., Beaumont, Tex. (KRIC); 1470 kc 5 kw unl, DA—night.

Dated: March 18, 1948.

FEDERAL COMMUNICATIONS COMMISSION,
[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2821; Filed, Mar. 30, 1948;
8:53 a. m.]

RECORDING DEVICES

NOTICE OF INFORMAL CONFERENCE

MARCH 17, 1948.

Notice is hereby given that an informal conference will be held at the offices of the Commission in Washington, D. C., beginning on April 6, 1948 at 10:00 a. m., before Commissioners Walker and Durr, for the purpose of considering certain questions presented by the petition filed on December 19, 1947 by the Bell System Companies requesting the Commission to modify its order of November 26, 1947 in

Docket No. 6787, In the Matter of the Use of Recording Devices in Connection with Telephone Service, and by statements in opposition to such petition and counter-petitions filed by various parties to the proceeding in Docket No. 6787. The questions to be considered at this conference shall include the following:

1. Whether the furnishing, installation and maintenance of the automatic tone warning device, contemplated by the order of November 26, 1947, shall be made the sole responsibility of the company or other organization responsible for the rendition of the telephone service.

2. The reasonableness of the estimated costs and proposed charges of the Bell System Companies for recorder-conductor equipment, as such costs and charges are described in the letter of January 5, 1948 from the American Telephone and Telegraph Company, a copy of which is attached to this notice.

3. The reasonableness of the arrangements proposed by the Bell System for permitting sales demonstrations of recording devices by recorder organizations, as such arrangements are described in the letter of February 11, 1948 from the American Telephone and Telegraph Company, a copy of which is also attached to this notice.

All telephone companies and manufacturers of telephone recording devices are requested to send qualified representatives to this informal conference and the state telephone regulatory commissions and all other interested persons are invited to participate.

Interested parties should advise the Commission in writing no later than April 1, 1948 of their intention to participate in this conference.

FEDERAL COMMUNICATIONS COMMISSION,

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2832; Filed, Mar. 30, 1948;
8:55 a. m.]

[Docket No. 6883]

CRESCENT BROADCAST CORP. ORDER CONTINUING HEARING

In re application of Crescent Broadcast Corporation, Shenandoah, Pennsylvania, Docket No. 6883, File No. BP-4092; for construction permit.

Whereas, the above-entitled application is scheduled to be heard at Washington, D. C., on March 18, 1948; and

Whereas, the above-entitled applicant has filed a petition for reconsideration and grant without hearing of the above-entitled application, and the public interest, convenience and necessity would be served by a continuance of the said hearing pending disposition of the said petition;

It is ordered, This 17th day of March, 1948, that the said hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Wednesday, April 7, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2837; Filed, Mar. 30, 1948;
8:55 a. m.]

[Docket Nos. 7281, 7283, 8745, 8746, 8845, 8873, 8874]

DON LEE BROADCASTING SYSTEM ET AL.

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of Don Lee Broadcasting System, San Francisco, California, Docket No. 7281, File No. BPCT-22; Television Productions, Inc., San Francisco, California, Docket No. 7283, File No. BPCT-151; S. H. Patterson, San Francisco, California, Docket No. 8745, File No. BPCT-225; Krow, Inc., Oakland, California, Docket No. 8746, File No. BPCT-235; Leland Holzer, San Francisco, California, Docket No. 8845, File No. BPCT-354; Radio Diablo, Inc., San Francisco, California, Docket No. 8873, File No. BPCT-368; Columbia Broadcasting System, Inc., San Francisco, California, Docket No. 8874, File No. BPCT-372; for construction permits for television stations.

At a session of the Federal Communications Commission held at its offices in Washington, D. C., on the 17th day of March 1948;

The Commission having under consideration the above applications of Leland Holzer (File No. BPCT-354), Radio Diablo, Inc. (BPCT-368), and the Columbia Broadcasting System, Inc. (File No. BPCT-372), each requesting a construction permit for a television broadcast station to operate unlimited time on a television channel allocated to the San Francisco-Oakland metropolitan district under § 3.606 of the Commission's rules and regulations; and

It appearing that on January 30, 1948 the Commission designated for consolidated hearing applications pending for construction permits for television broadcast stations to operate on unassigned channels allocated to the San Francisco-Oakland metropolitan district because said applications exceeded in number the unassigned channels allocated to said district under § 3.606 of the Commission's rules and regulations;

It is ordered, That pursuant to section 309 (a) of the Communications Act of 1934, as amended, the applications of Leland Holzer (File No. BPCT-354) Radio Diablo, Inc., (File No. BPCT-368), Columbia Broadcasting System, Inc. (BPCT-372) be, and they are hereby, designated for hearing in a consolidated proceeding with the other above entitled applications for construction permits for television broadcast stations to operate on channels allocated to the San Francisco-Oakland metropolitan district, the consolidated hearing to begin at 10 o'clock a. m. at San Francisco, California on April 5, 1948, upon the following issues:

1. To determine the legal, technical, financial and other qualifications of the applicant to operate and construct the proposed station.

2. To obtain full information with respect to the nature and character of the proposed program service.

3. To determine the areas and populations which may be expected to receive service from the proposed station.

4. To determine on a comparative basis which, if any, of the applications

in this consolidated proceeding should be granted.

5. To determine the stock ownership and management interests of Paramount Pictures, Inc. in the following companies: Allen B. DuMont Laboratories, Inc., New England Theatres, Inc., United Detroit Theatres Corporation, Balaban and Katz Corporation, Interstate Circuit, Inc., and Television Productions, Inc.

6. Whether, in the light of the evidence adduced at the hearing with respect to issue number "5", a grant of the application of Television Productions, Inc. (File No. BPCT-151) would be consistent with § 3.640 of the Commission's rules and regulations.

7. To determine whether the operation of the proposed station would involve objectionable interference with any other existing television broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other television broadcast service to such areas and populations.

8. To determine whether the operation of the proposed station would involve objectionable interference with the services proposed in any other pending applications for television broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other television broadcast service to such areas and populations.

9. To determine whether the installation and operation of the proposed station would be in compliance with the Commission's rules Governing Television Broadcast Stations, and its Standards of Good Engineering Practice Concerning Television Broadcast Stations.

It is further ordered, That the issues in Dockets 7281, 7283, 8745, and 8746 be, and they are hereby, amended to correspond in each case to issues 1 to 9 above, both inclusive;

It is further ordered, That the consolidated hearing on the above-entitled applications with respect to issues numbers "5" and "6" only is further consolidated with the hearing designated October 15, 1947 on the applications of Allen B. DuMont Laboratories, Inc. (File Nos. BPCT-161 and BPCT-163), New England Theatres, Inc. (File No. BPCT-140), United Detroit Theatres Corporation (File No. BPCT-50) and Interstate Circuit, Inc. (File No. BPCT-94) to be held on May 10, 1948 at 10 o'clock a. m. at Washington, D. C.

FEDERAL COMMUNICATIONS
COMMISSION,

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2822; Filed, Mar. 30, 1948;
8:53 a. m.]

[Docket Nos. 7490, 8341, 8867-8869]

KFJI BROADCASTERS ET AL.

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of KFJI Broadcasters (KFJI), Klamath Falls, Oregon, Docket No. 8867, File No. BP-4573; Gila

Broadcasting Company, Coolidge, Arizona, Docket No. 8868, File No. BP-4677; Mosby's Incorporated, Great Falls, Montana, Docket No. 8869, File No. BP-5481; KSAL, Inc. (KSAL), Salina, Kansas, Docket No. 7490, File No. BP-4364; Radio Broadcasters, Incorporated (KRKD), Los Angeles, California, Docket No. 8341, File No. BML-1242 (CP); for construction permits.

At a session of the Federal Communications Commission, held at its offices in Washington, D. C., on the 18th day of March 1948;

The Commission having under consideration (1) a petition filed May 19, 1947, by Radio Sales Corporation, licensee of Station KRSC at Seattle, Washington, requesting reconsideration of the Commission's actions of April 29, 1947, in granting without hearing the above-entitled applications of (a) KFJI Broadcasters (KFJI) for a construction permit to change the facilities of Station KFJI in Klamath Falls, Oregon, from a Class IV assignment on 1240 kc to the assignment of 1150 kc, with 1 kw power, unlimited time, employing a directional antenna at night; (b) Gila Broadcasting Company for a permit to construct a new standard broadcast station in Coolidge, Arizona, to operate on 1150 kc, with 1 kw power, unlimited time employing a directional antenna at night; and (c) Mosby's Incorporated for a permit to construct a new standard broadcast station in Great Falls, Montana, to operate on 1150 kc, with 5 kw power, unlimited time employing a directional antenna at night; (2) a petition filed May 19, 1947, by KSAL, Inc., licensee of station KSAL at Salina, Kansas, requesting reconsideration of the Commission's action of April 29, 1947, in making a partial grant of its above-entitled application to increase the operating power of Station KSAL, operating on 1150 kc, from 1 kw to 5 kw, by authorizing operation with 5 kw power daytime and leaving the nighttime operating power at 1 kw, said petition praying in the alternative that the Commission either grant the KSAL application for operation with 5 kw power at night or designate said application for hearing in a consolidated proceeding with the above-entitled applications of Gila Broadcasting Company and Radio Broadcasters, Incorporated (KRKD); and (3) the above-entitled application of Radio Broadcasters, Incorporated (KRKD), which originally requested a modification of the license for Station KRKD (1150 kc, 1 kw, 2.5 kw-LS, S/KFSG) in Los Angeles, California, to increase nighttime power from 1 kw to 2.5 kw, which on April 29, 1947, was designated for hearing, and which was subsequently amended to specify a change in transmitter location and an increase in daytime power to 5 kw (leaving nighttime power at 1 kw) and removed from the hearing docket; and

It appearing that the applications of KFJI (Klamath Falls, Oregon) and of the new stations at Coolidge, Arizona (Gila Broadcasting Company) and Great Falls, Montana (Mosby's Incorporated) would not in themselves cause objectionable interference to Station KRSC at Seattle, Washington, the licensee of which

has petitioned for reconsideration of the grants of said proposals, but that said proposed operations in combination with the proposed nighttime operations of Stations KSAL (Salina, Kansas) and KRKD (Los Angeles, California) would cause objectionable interference to Station KRSC; and

It further appearing, that the proposed operation of Stations KFJI and KSAL would cause objectionable interference to Station KRKD as now operating; and

It further appearing, that the five above-entitled applications involve problems of objectionable interference to Station KRSC, KRKD and with each other, and that the public interest requires a hearing on all said applications before any are finally granted;

It is, therefore, ordered, That, pursuant to sections 309 (a) and 405 of the Communications Act of 1934, as amended, and § 1.390 of the Commission's rules and regulations, the said petition of Radio Sales Corporation (KRSC) be, and it is hereby, granted; that the said petition of KSAL, Inc. (KSAL), insofar as it requests that its application for an increase in nighttime power be designated for hearing, be, and it is hereby, granted, and otherwise be, and it is hereby, denied; that the grants of the above-entitled applications of KFJI Broadcasters, Gila Broadcasting Company and Mosby's Incorporated, insofar as they relate to nighttime operation, be, and they are hereby, set aside; and that the above-entitled applications of KFJI Broadcasters, Gila Broadcasting Company, Mosby's Incorporated, KSAL, Inc. (insofar as they request nighttime operation) and Radio Broadcasters, Incorporated, be, and they are hereby, designated for hearing in a consolidated proceeding, at a time and place to be designated by subsequent order of the Commission, upon the following issues:

1. To determine the legal, technical, financial and other qualifications of the applicant corporations, their officers, directors and stockholders to construct and operate the proposed stations or stations as proposed.

2. To determine the areas and populations which may be expected to gain or lose primary service from the operation of the proposed stations or stations as proposed, and the character of other broadcast services available to those areas and populations.

3. To determine the type and character of program service proposed to be rendered and whether it would meet the requirements of the populations and areas proposed to be served.

4. To determine whether the operation of the proposed stations or stations as proposed would involve objectionable interference with Stations KRSC, Seattle, Washington, and KRKD, Los Angeles, California, or with any other existing broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

5. To determine whether the operation of any of the proposed stations or stations as proposed would involve objectionable interference with the service

proposed in any of the other applications in the consolidated proceeding, or in any other pending applications for broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

6. To determine whether the installation and operation of the proposed stations or stations as proposed would be in compliance with the Commission's rules and Standards of Good Engineering Practice Concerning Standard Broadcast Stations.

7. To determine on a comparative basis which, if any, of the applications in this consolidated proceeding should be granted.

It is further ordered, That Radio Sales Corporation, licensee of Station KRSC, Seattle, Washington, and Radio Broadcasters Incorporated, licensee of Station KRKD, Los Angeles, California, be, and they are hereby, made parties to this proceeding.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2823; Filed, Mar. 30, 1948;
8:53 a. m.]

[Docket Nos. 7906, 8364]

WCAR, INC., AND UAW-CIO
BROADCASTING CORP.

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of WCAR, Inc. (WCAR), Detroit, Michigan, Docket No. 8364, File No. BP-5971; UAW-CIO Broadcasting Corporation, Detroit, Michigan, Docket No. 7906, File No. BP-5358; for construction permits.

At a session of the Federal Communications Commission held March 17, 1948, at its offices in Washington, D. C.:

The Commission having under consideration a petition for review, and supplement thereto, filed March 10 and 12, 1948, by UAW-CIO Broadcasting Corporation, Detroit, Michigan, directed against the Motions Commissioner's action of March 8, 1948, denying insofar as it requested leave to amend, a petition filed February 26, 1948, by UAW-CIO Broadcasting Corporation, Detroit, Michigan, requesting that the Commission grant leave to amend its application for construction permit to specify 1130 kc, 5 kw daytime and 2.5 kw nighttime, unlimited time, using directional antenna day and night, in lieu of 680 kc, 250 watts power, daytime only, at Detroit, Michigan; that the amended application be removed from the hearing docket; that the amended application be designated for hearing on March 17, 1948, in a consolidated proceeding with the above-entitled application for change of location, power, and hours of operation of WCAR, Inc. (WCAR), Detroit, Michigan; and that the issues in the hearing on the application of WCAR, Inc. (WCAR), be enlarged to include a determination of whether there is available at Pontiac, Michigan, a frequency other than 1130

kc on which Station WCAR, Pontiac, Michigan, can operate daytime only; and

The Commission also having under consideration the balance of the said petition filed February 26, 1948, by UAW-CIO Broadcasting Corporation, and an opposition to the said petition filed March 5, 1948, by WCAR, Inc. (WCAR);

It appearing, that the above-entitled application of UAW-CIO Broadcasting Corporation was heard in a consolidated proceeding and the record certified complete on January 10, 1947; that, pursuant to the Commission's public notice of May 9, 1947 (Mimeo. No. 6630) that the Commission would defer action on all pending applications requesting daytime or limited time operation on 1-A or 1-B frequencies until the termination of the daytime skywave transmissions proceeding (Docket No. 8333), a proposed decision has not been adopted in the proceeding on petitioner's above-entitled application; that the broadcast facilities requested in the proposed amendment to the above-entitled application would provide service to a larger population and area more hours per day than would the facilities requested in the above-entitled application; and

It further appearing that, although the proposed amendment is not complete, because of petitioner's failure to answer questions 12 (a), 32, 33 (a), 34 (a) and (b) and 41 (A) (b) (3) of the application Form 301 and failure to file promptly an affidavit of consideration (subsequently filed March 4, 1948), the amendment is substantially complete and may be accepted under the provisions of the Commission's rules and regulations; and that a denial of the petition because of the said omissions would be inconsistent with the Commission's policy and practice as expressed in its Memorandum Opinion and Order in the matter of Middleboro Broadcasting Company, Inc. (Docket No. 7002) (1946) 3 RR 273, and its Memorandum Opinion and Order in the matter of Hearst Radio, Inc. (WBAL) (Docket No. 7400) (1947) 3 RR 731; and

It further appearing that acceptance of the proposed amendment would not be inconsistent with the Commission's action of August 9, 1946, denying a petition for leave to amend filed by Piedmont Broadcasting Corporation (WBTM), Danville, Virginia, in that the Commission has not adopted a proposed decision in the proceeding on the above-entitled application; and

It further appearing that the application, as amended, would be a substantially new application, but that the petition for leave to amend was filed twenty days before the scheduled hearing date in the proceeding on the above-entitled application of WCAR, Inc. (WCAR); that the Commission has consistently regarded the date of filing an amendment and petition for leave to amend, rather than the date of action on the petition and amendment, as the controlling date for the purpose of applying the twenty-day limitation provided by § 1.387 of the Commission's rules on the consolidation for hearing of new applications with applications previously designated for hearing; and

It further appearing that petitioner's request for enlargement of the issues

designated for hearing in the proceeding on the above-entitled application of WCAR, Inc. (WCAR), is not supported by technical data; that the Commission has uniformly denied petitions for enlargement of issues to include the availability of frequencies other than those requested in applications unless petitioner has supplied supporting technical information; and that the submission of such technical data is essential to a ruling on a request for such enlargement of issues;

It is ordered, That the petition for review be, and it is hereby, granted; that the petition filed February 26, 1948, be, and it is hereby, granted to the extent that it requests leave to amend the above-entitled application of UAW-CIO Broadcasting Corporation and designation for consolidation with the above-entitled application of WCAR, Inc. (WCAR); that the amendment filed simultaneously with the petition be, and it is hereby, accepted; and

It is further ordered, That pursuant to section 309 (a) of the Communications Act of 1934, as amended, the said application of UAW-CIO Broadcasting Corporation be, and it is hereby, designated for hearing in a consolidated proceeding with the said application of WCAR, Inc. (WCAR), at Washington, D. C., on March 18, 1948, upon the following issues:

1. To determine the legal, technical, financial, and other qualifications of the applicant corporation, its officers, directors and stockholders, to construct and operate the proposed station.

2. To determine the areas and populations which may be expected to gain or lose primary service from the operation of the proposed station and the character of other broadcast service available to those areas and populations.

3. To determine the type and character of program service proposed to be rendered and whether it would meet the requirements of the populations and areas proposed to be served.

4. To determine whether the operation of the proposed station would involve objectionable interference with any existing broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

5. To determine whether the operation of the proposed station would involve objectionable interference with the services proposed in the pending application of WCAR, Inc. (WCAR), Detroit, Michigan (File No. BP-5971; Docket No. 8364), or in any other pending applications for broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

6. To determine whether the installation and operation of the proposed station would be in compliance with the Commission's rules and Standards of Good Engineering Practice Concerning Standard Broadcast Stations.

7. To determine on a comparative basis which, if either, of the applications in this consolidated proceeding should be granted.

NOTICES

It is further ordered, That the petition be, and it is hereby, denied to the extent that it requests enlargement of the issues designated for hearing in the proceeding on the said application of WCAR, Inc. (WCAR), to include a determination of whether there is available at Pontiac, Mich., a frequency other than 1130 kc. on which Station WCAR, Pontiac, Mich., can operate daytime only.

FEDERAL COMMUNICATIONS
COMMISSION,

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2824; Filed, Mar. 30, 1948;
8:54 a. m.]

[Docket Nos. 7998, 7999]

JORAMA-FER RADIO CORP. AND CAGUAS
RADIO BROADCASTING, INC.

ORDER CONTINUING HEARING

In re applications of Jorama-Fer Radio Corporation, Caguas, Puerto Rico, Docket No. 7998, File No. BP-5174; Caguas Radio Broadcasting, Inc., Caguas, Puerto Rico, Docket No. 7999, File No. BP-5475; for construction permits.

Whereas the above-entitled applications are scheduled to be heard in a consolidated proceeding on March 22, 1948, at Washington, D. C.:

It appearing that the applicants have requested the use of the waiver of hearing procedure provided by § 1.391 of the Commission's rules and regulations;

It is ordered, This 19th day of March, 1948, that the said hearing on the above-entitled applications be and it is hereby continued to 10:00 a. m., Friday, April 9, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2846; Filed, Mar. 30, 1948;
8:56 a. m.]

[Docket Nos. 8030, 8789]

ENID BROADCASTING CO. AND LEADER
PUBLISHING CO.

ORDER CONTINUING HEARING

In re applications of Enid Broadcasting Company, Enid, Oklahoma, Docket No. 8030, File No. BP-5489; Leader Publishing Company, Guthrie, Oklahoma, Docket No. 8789, File No. BP-6577; for construction permits.

The Commission having under consideration a petition filed March 10, 1948, by Enid Broadcasting Company, Enid, Oklahoma, requesting a 45-day continuance of the hearing now scheduled for March 29 and 30, 1948, at Enid and Guthrie, Oklahoma, on the above-entitled applications;

It is ordered, This 19th day of March, 1948, that the petition be, and it is hereby, granted; and that the said hearing on the above-entitled proceeding be, and it is hereby, continued to 10:00 a. m., Wednesday, May 19, 1948, at Guthrie,

Oklahoma, and May 20, 1948, at Enid, Oklahoma.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2845; Filed, Mar. 30, 1948;
8:56 a. m.]

[Docket Nos. 8083, 8084]

CAPITOL BROADCASTING CO. AND WSWZ,
INC.

ORDER CONTINUING HEARING

In re applications of Capitol Broadcasting Company, Trenton, New Jersey, Docket No. 8083, File No. BP-4832; WSWZ, Incorporated, Trenton, New Jersey, Docket No. 8084, File No. BP-5590; for construction permits.

The Commission having under consideration a joint petition filed March 2, 1948, by Capitol Broadcasting Company, Trenton, New Jersey, and WSWZ, Incorporated, Trenton, New Jersey, requesting that the Commission continue the consolidated hearing on their above-entitled applications for construction permits from March 18, 1948, to April 5, 1948, at Washington, D. C.;

It is ordered, This 17th day of March, 1948, that the petition be, and it is hereby, granted; and that the said hearing on the above-entitled applications be, and it is hereby, continued to 10:00 a. m., Monday, April 5, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2838; Filed, Mar. 30, 1948;
8:55 a. m.]

[Docket No. 8074]

UNION-CAROLINA BROADCASTING CO.

ORDER CONTINUING HEARING

In re application of Union-Carolina Broadcasting Company, Union, South Carolina, Docket No. 8074, File No. BP-5304; for construction permit.

The Commission having under consideration a petition filed March 12, 1948, by Union-Carolina Broadcasting Company, Union, South Carolina, requesting a 20-day continuance of the hearing now scheduled for March 22, 1948, on its above-entitled application for construction permit;

It is ordered, This 19th day of March 1948, that the petition be, and it is hereby, granted; and that the said hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Friday, April 9, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2843; Filed, Mar. 30, 1948;
8:56 a. m.]

[Docket Nos. 8185, 8186]

E. F. PEPPER (KGDM) AND SACRAMENTO
BROADCASTERS, INC.

ORDER CONTINUING HEARING

In re applications of E. F. Pepper (KGDM), Stockton, California, Docket No. 8185, File No. BP-5554; Sacramento Broadcasters, Inc., Chico, California, Docket No. 8186, File No. BP-5745; for construction permits.

The Commission having under consideration a joint petition filed March 10, 1948, by E. F. Pepper (KGDM), Stockton, California, and Sacramento Broadcasters, Inc., Chico, California, requesting a 60-day continuance of the consolidated hearing presently scheduled for March 25, 1948, at Washington, D. C., on their above-entitled applications for construction permits;

It is ordered, This 19th day of March, 1948, that the petition be, and it is hereby, granted; and that the said hearing on the above-entitled applications be, and it is hereby continued to 10:00 a. m., Thursday, May 27, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2849; Filed, Mar. 30, 1948;
8:56 a. m.]

[Docket Nos. 8239, 8240, 8846]

CONNECTICUT ELECTRONICS CORP. ET AL.

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of The Connecticut Electronics Corporation, Bridgeport, Connecticut, Docket No. 8239, File No. BP-5375; Westco Broadcasting Corporation, White Plains, New York, Docket No. 8240, File No. BP-5899; Huntington-Montauk Broadcasting Company, Inc., Huntington, New York, Docket No. 8846, File No. BP-6595; for construction permits.

At a session of the Federal Communications Commission held at its offices in Washington, D. C., on the 18th day of March 1948;

The Commission having under consideration the above-entitled application of Huntington-Montauk Broadcasting Company, Inc., filed February 16, 1948, requesting authorization to construct a new standard broadcast station at Huntington, New York, to operate on 740 kc, with 1 kw power, daytime only; and applicant's petition requesting that, because of mutually exclusive interference, its application be designated for hearing with the applications of The Connecticut Electronics Corporation and Westco Broadcasting Corporation, requesting 740 kc at Bridgeport, Connecticut, and White Plains, New York, previously designated for hearing in a consolidated proceeding, the hearing currently scheduled for April 5 and 6, 1948, at Bridgeport, Connecticut, and White Plains, New York, respectively;

It is ordered, That the said petition be, and it is hereby, granted, and that, pur-

suant to section 309 (a) of the Communications Act of 1934, at amended, the said application of Huntington-Montauk Broadcasting Company, Inc., be, and it is hereby, designated for hearing in the aforesaid consolidated proceeding, the hearing thereon to be held at Huntington, New York, on April 7, 1948, upon the following issues:

1. To determine the legal, technical, financial and other qualifications of the applicant corporation, its officers, directors and stockholders to construct and operate the proposed station.

2. To determine the areas and populations which may be expected to gain or lose primary service from the operation of the proposed station and the character of other broadcast service available to those areas and populations.

3. To determine the type and character of program service proposed to be rendered and whether it would meet the requirements of the populations and areas proposed to be served.

4. To determine whether the operation of the proposed station would involve objectionable interference with any existing broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

5. To determine whether the operation of the proposed station would involve objectionable interference with the services proposed in any other pending applications for broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

6. To determine whether the installation and operation of the proposed station would be in compliance with the Commission's rules and Standards of Good Engineering Practice Concerning Standard Broadcast Stations.

7. To determine on a comparative basis which, if any, of the applications in this consolidated proceeding should be granted.

It is further ordered, That the Commission's order, dated March 20, 1947, designating the applications of The Connecticut Electronics Corporation and Westco Broadcasting Corporation (then applying as George J. Feinberg and J. Harvey McCoy, d/b as Heathcote Broadcasting Company, Scarsdale, New York) for hearing be, and it is hereby amended to include the above-entitled application of Huntington-Montauk Broadcasting Company, Inc., and that Issue No. 7 of the said order be, and it is hereby, amended to conform with issue No. 7 set forth herein.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2825; Filed, Mar. 30, 1948;
8:54 a. m.]

[Docket No. 8254]

MT. PLEASANT BROADCASTING CO.

ORDER CONTINUING HEARING

In re application of Winston O. Ward, tr/as Mt. Pleasant Broadcasting Com-

pany, Mt. Pleasant, Texas, Docket No. 8254, File No. BP-5439; for construction permit.

Whereas, the above-entitled application of Winston O. Ward, tr/as Mt. Pleasant Broadcasting Company, Mt. Pleasant, Texas, is scheduled to be heard at Washington, D. C., on March 18, 1948; and

Whereas, the said applicant filed on February 5, 1948, a petition requesting reconsideration and grant without hearing of the above-entitled application, which has not yet been acted on by the Commission; and

Whereas, the public interest, convenience, and necessity would be served by a continuance of the hearing on the above-entitled application until the Commission has had an opportunity to act on the said petition for reconsideration and grant without hearing;

It is ordered, This 17th day of March, 1948, that the said hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Tuesday, April 6, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2836; Filed, Mar. 30, 1948,
8:55 a. m.]

[Docket Nos. 8276, 8277]

COCONINO BROADCASTING CO. AND GRAND CANYON BROADCASTING CO. (KWRZ)

ORDER CONTINUING HEARING

In re applications of Coconino Broadcasting Company, Flagstaff, Arizona, Docket No. 8276, File No. BP-5667; James L. Stapleton, Jessie Martin, and Duard K. Howlin, d/b as Grand Canyon Broadcasting Company (KWRZ), Flagstaff, Arizona, Docket No. 8277, File No. BP-6004; for construction permits.

The Commission having under consideration a petition filed March 12, 1948, by Coconino Broadcasting Company, Flagstaff, Arizona, requesting a 20-day continuance of the hearing now scheduled for March 23, 1948, at Washington, D. C., on the above-entitled applications for construction permits;

It is ordered, This 19th day of March, 1948, that the petition be, and it is hereby, granted; and that the hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Monday, April 12, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2848; Filed, Mar. 30, 1948;
8:56 a. m.]

[Docket No. 8301]

RIDSON, INC. (WDSM)

ORDER CONTINUING HEARING

In re application of Ridson, Incorporated (WDSM), Superior, Wisconsin, Docket No. 8301, File No. BP-5638; for construction permit.

The Commission having under consideration a petition filed March 18, 1948, by Ridson, Inc. (WDSM), Superior, Wisconsin, requesting a continuance of the hearing now scheduled for March 24, 1948, at Washington, D. C., on its above-entitled application for construction permit;

It is ordered, This 19th day of March, 1948, that the petition be, and it is hereby, granted; and that the said hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Wednesday, April 14, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2847; Filed, Mar. 30, 1948;
8:56 a. m.]

[Docket No. 8364]

WGAR, INC.

ORDER CONTINUING HEARING

In re application of WGAR, Incorporated (WGAR), Pontiac, Michigan, Docket No. 8364, File No. BP-5971; for construction permit.

Whereas, the above-entitled application is scheduled to be heard at Washington, D. C., on March 17, 1948; and

Whereas, the examiner designated by the Commission to preside at the said hearing is prevented by acute illness from presiding at the said hearing;

It is ordered, This 17th day of March, 1948, that the said hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Thursday, March 18, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2835; Filed, Mar. 30, 1948;
8:55 a. m.]

[Docket No. 8384]

BIRNEY IMES, JR. (WELO)

ORDER CONTINUING HEARING

In re application of Birney Imes, Jr. (WELO), Tupelo, Mississippi, Docket No. 8384, File No. BP-4719; for construction permit.

The Commission having under consideration a petition filed March 16, 1948, by Birney Imes, Jr. (WELO), Tupelo, Mississippi, requesting a 60-day continuance of the hearing now scheduled for March 22, 1948, at Washington, D. C., on his above-entitled application for construction permit;

It is ordered, This 19th day of March, 1948, that the petition be, and it is hereby, granted; and that the said hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Tuesday, May 18, 1948, at Washington, D. C.

By the Commission.

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2844; Filed, Mar. 30, 1948;
8:56 a. m.]

[Docket Nos. 8428-8430]

HOWDY FOLKS BROADCASTERS ET AL.

ORDER CONTINUING HEARING

In re applications of Howdy Folks Broadcasters, Tulsa, Oklahoma, Docket No. 8428, File No. BP-5853; Donald W. Reynolds, Okmulgee, Oklahoma, Docket No. 8429, File No. BP-5871; Muskogee, Broadway Broadcasting Company, Muskogee, Oklahoma, Docket No. 8430, File No. BP-5918; for construction permits.

Whereas, the above-entitled applications are scheduled to be heard on March 17, 18, and 19, 1948; and

Whereas, counsel for Howdy Folks Broadcasters, Tulsa, Oklahoma, and Muskogee Broadway Broadcasting Company, Muskogee, Oklahoma, have orally advised the Commission that their respective applicants will request dismissal without prejudice of their above-entitled applications in the near future; and counsel for Donald W. Reynolds has orally advised the Commission that their applicant in the near future will request a continuance of the hearing now scheduled for March 19, 1948, on his above-entitled application;

It is ordered, This 15th day of March, 1948, that the said hearing on the above-entitled applications be, and it is hereby, continued to 10:00 a. m., Tuesday, April 6, 1948.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.[F. R. Doc. 48-2833; Filed, Mar. 30, 1948;
8:55 a. m.]

[Docket Nos. 8455, 8456, 8528, 8853, 8860]

NORMAN BROADCASTING CO. ET AL.

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of Norman Broadcasting Company, Norman, Oklahoma, Docket No. 8455, File No. BP-5839; H. J. Griffith, tr/as H. J. Griffith Broadcasting Company, Norman, Oklahoma, Docket No. 8456, File No. BP-5861; University City Broadcasting Company, Norman, Oklahoma, Docket No. 8528, File No. BP-6293; Tol Dickenson, William S. Morgan and Howard DeMere, a partnership d/b as Cleveland County Broadcasting Company, Norman, Oklahoma, Docket No. 8853, File No. BP-6619; Sooner Broadcasting Company (KTOW), Oklahoma City, Oklahoma, Docket No. 8860, File No. BP-6646; for construction permits.

At a session of the Federal Communications Commission, held at its offices in Washington, D. C. on the 18th day of March 1948;

The Commission having under consideration the above-entitled applications (filed February 27, 1948) of Tol Dickenson, William S. Morgan and Howard DeMere, a partnership d/b as Cleveland County Broadcasting Company requesting authorization to construct a new standard broadcast station to operate on 1400 kc, with 250 w power, unlimited time at Norman, Oklahoma, and Sooner Broadcasting Company

(KTOW), requesting reassignment at Oklahoma City so as to operate on 1400 kc, with 250 w power, unlimited time;

It appearing that on October 2, 1947, the Commission designated the application of University City Broadcasting Company for hearing in a previously designated (July 3, 1947) consolidated proceeding involving the applications of H. J. Griffith, tr/as H. J. Griffith Broadcasting Company, and Byrne Ross and W. P. Fowler, d/b as Norman Broadcasting Company, each of the three applicants requesting 1400 kc, with 250 w power, unlimited time at Norman, Oklahoma, said hearing having been scheduled for March 22, 23, and 24, 1948, at Norman, Oklahoma.

It is ordered, That, pursuant to section 309 (a) of the Communications Act of 1934, as amended, the said applications of Tol Dickenson, William S. Morgan and Howard DeMere, a partnership d/b as Cleveland Broadcasting Company (File No. BP-6619), and Sooner Broadcasting Company (File No. BP-6646) be, and they are hereby, designated for hearing in the aforesaid consolidated proceeding, the hearing thereon to be held on March 25, 1948, at Norman, Oklahoma, and on March 26, 1948, at Oklahoma City respectively, upon the following issues:

1. To determine the legal, technical, financial and other qualifications of the applicant partnership and the partners to construct and operate the proposed station, and the technical, financial and other qualifications of the applicant corporation, its officers, directors and stockholders to construct and operate station KTOW as proposed.

2. To determine the areas and populations which may be expected to gain or lose primary service from the operation of the proposed station and station KTOW as proposed and the character of other broadcast service available to those areas and populations.

3. To determine the type and character of program service proposed to be rendered and whether it would meet the requirements of the populations and areas proposed to be served.

4. To determine whether the operation of the proposed station and station KTOW as proposed would involve objectionable interference with any existing broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

5. To determine whether the operation of the proposed station and station KTOW as proposed would involve objectionable interference with the services proposed in the other applications in this proceeding or in any other pending applications for broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

6. To determine whether the installation and operation of the proposed station and station KTOW as proposed would be in compliance with the Commission's rules and Standards of Good Engineering Practice Concerning Standard Broadcast Stations.

7. To determine on a comparative basis which, if any, of the applications in this consolidated proceeding should be granted.

It is further ordered, That the Commission's orders of July 3 and October 2, 1947, designating the above-entitled applications of Norman Broadcasting Company (File No. BP-5839; Docket No. 8455); H. J. Griffith Broadcasting Company (File No. BP-5861; Docket 8456); and University City Broadcasting Company (File No. BP-6293; Docket No. 8528) for hearing in a consolidated proceeding be, and they are hereby amended to include the above-entitled applications of Cleveland County Broadcasting Company (File No. BP-6619) and Sooner Broadcasting Company (File No. BP-6646).

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.[F. R. Doc. 48-2828; Filed, Mar. 30, 1948;
8:54 a. m.]

[Docket No. 8480]

SALT RIVER VALLEY BROADCASTING CO.
(KOY)

ORDER CONTINUING HEARING

In re application of Salt River Valley Broadcasting Company (KOY), Phoenix, Arizona, Docket No. 8480, File No. BP-5733; for construction permit.

The Commission having under consideration a petition filed March 12, 1948, by Salt River Valley Broadcasting Company (KOY), Phoenix, Arizona, requesting a continuance to April 12, 1948, of the hearing now scheduled for March 23, 1948, at Washington, D. C., on its above-entitled application for construction permit;

It is ordered, This 19th day of March, 1948, that the petition be, and it is hereby, granted; and that the said hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Monday, April 12, 1948, at Washington, D. C.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.[F. R. Doc. 48-2842; Filed, Mar. 30, 1948;
8:56 a. m.]

[Docket No. 8512]

THOMAS PATRICK, INC. (KWK)

ORDER CONTINUING HEARING

In re application of Thomas Patrick, Incorporated (KWK), St. Louis, Missouri, Docket No. 8512, File No. BP-4843; for construction permit.

The Commission having under consideration a petition filed March 15, 1948, by Thomas Patrick, Inc. (KWK), St. Louis, Missouri, requesting a 30-day continuance of the hearing on its above-entitled application for construction permit now scheduled for March 24, 1948, at Washington, D. C.;

It is ordered, This 19th day of March, 1948, that the petition be, and it is hereby, granted; and that the said hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Monday, April 26, 1948, at Washington, D. C.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2841; Filed, Mar. 30, 1948;
8:56 a. m.]

[Docket Nos. 8661, 8662, 8781]

NEW ENGLAND TELEVISION CO., INC., ET AL.

ORDER CONTINUING HEARING

In re applications of New England Television Co., Inc., Fall River, Massachusetts, Docket No. 8661, File No. BPCT-209; E. Anthony & Sons, Inc., New Bedford, Massachusetts, Docket No. 8662, File No. BPCT-217; Fall River Herald News Publishing Company, Fall River, Massachusetts, Docket No. 8781, File No. BPCT-301; for construction permits.

The Commission having under consideration a petition filed March 12, 1948, by Fall River Herald News Publishing Company, Fall River, Massachusetts, requesting that the hearing on its above-entitled application and the above-entitled applications of New England Television Company, Inc., Fall River, Massachusetts, and E. Anthony & Sons, Inc., New Bedford, Massachusetts, be continued from March 25 to April 7, 1948;

It is ordered, This 19th day of March, 1948, that the petition be, and it is hereby, granted; and that the hearing on the above-entitled proceeding be, and it is hereby, continued to 10:00 a. m., Wednesday, April 7, and Thursday, April 8, 1948, at Fall River, Massachusetts, and Friday, April 9, 1948, at New Bedford, Massachusetts.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2840; Filed, Mar. 30, 1948;
8:55 a. m.]

[Docket No. 8710]

EMPORIA BROADCASTING CO., INC. (KTSW)

ORDER CONTINUING HEARING

In re application of Emporia Broadcasting Company, Inc. (KTSW), Emporia, Kansas, Docket No. 8710; for construction permit.

The Commission having under consideration a petition filed March 11, 1948, by Emporia Broadcasting Company, Inc. (KTSW), Emporia, Kansas, requesting a continuance of the hearing now scheduled for March 24, 1948, at Washington, D. C., in the above-entitled proceeding on an order to show cause whether petitioner has violated certain provisions of the Communications Act of 1934, as amended, and the Commission's rules and regulations, issued December 30, 1947;

It is ordered, This 19th day of March, 1948, that the petition be, and it is

hereby, granted; and that the said hearing on the above-entitled matter be, and it is hereby, continued to 10:00 a. m., Monday, April 26, 1948, at Washington, D. C.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2839; Filed, Mar. 30, 1948;
8:55 a. m.]

[Docket No. 8725]

FARMINGTON BROADCASTING CO.

ORDER CONTINUING HEARING

In re application of Harold L. Arment, tr/as The Farmington Broadcasting Company, Farmington, New Mexico, Docket No. 8725, File No. BP-5713; for construction permit.

Whereas, the above-entitled application is scheduled to be heard at Farmington, New Mexico, on March 19, 1948; and

Whereas, the above-entitled applicant has notified the Commission that it intends to file a petition requesting dismissal without prejudice of its above-entitled application.

It is ordered, This 17th day of March, 1948, that the said hearing on the above-entitled application be, and it is hereby, continued to 10:00 a. m., Friday, April 16, 1948, at Farmington, New Mexico.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2834; Filed, Mar. 30, 1948;
8:55 a. m.]

[Docket Nos. 8847, 8848]

ANTELOPE VALLEY BROADCASTING CO. AND
ANTELOPE BROADCASTING CO., INC.

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of Robert A. Campbell and Ray Birch, a partnership d/b as Antelope Valley Broadcasting Company, Lancaster, California, Docket No. 8847, File No. BP-6486; Antelope Broadcasting Company, Inc., Lancaster, California, Docket No. 8848, File No. BP-6576; for construction permits.

At a session of the Federal Communications Commission held at its offices at Washington, D. C. on the 18th day of March 1948;

The Commission having under consideration the above-entitled applications of Robert A. Campbell and Ray Birch, a partnership, d/b as Antelope Valley Broadcasting Company and Antelope Broadcasting Company, Inc., each requesting 1340 kc, with 250 w power, unlimited time at Lancaster, California;

It is ordered, That, pursuant to section 309 (a) of the Communications Act of 1934, as amended, the aforesaid applications be, and they are hereby, designated for hearing in a consolidated proceeding at a time and place to be designated by subsequent order of the Commission, upon the following issues;

1. To determine the legal, technical, financial, and other qualifications of the applicant partnership and the partners and of the applicant corporation, its officers, directors, and stockholders to construct and operate the proposed stations.

2. To determine the areas and populations which may be expected to gain or lose primary service from the operation of the proposed stations and the character of other broadcast service available to those areas and populations.

3. To determine the type and character of program service proposed to be rendered and whether it would meet the requirements of the populations and areas proposed to be served.

4. To determine whether the operation of the proposed stations would involve objectionable interference with any existing broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

5. To determine whether the operation of the proposed stations would involve objectionable interference with the services proposed in any other pending applications for broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

6. To determine whether the installation and operation of the proposed stations would be in compliance with the Commission's rules and Standards of Good Engineering Practice Concerning Standard Broadcast Stations.

7. To determine on a comparative basis which, if either of the applications in this consolidated proceeding should be granted.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2826; Filed, Mar. 30, 1948;
8:54 a. m.]

[Docket Nos. 8849-8852]

VOICE OF THE VALLEY CO. ET AL.

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of Albert Brightman Buffington, Edward Truman, Samuel J. Roley and Roger C. Patrick, a partnership d/b as Voice of the Valley Company, Van Nuys, California, Docket No. 8849, File No. BP-5741; Leland Holzer, Los Angeles, California, Docket No. 8851, File No. BP-6372; William Odessky and Lee A. Odessky, a partnership d/b as William and Lee A. Odessky, Los Angeles, California, Docket No. 8850, File No. BP-6023; Essie Binkley West, Riverside, California, Docket No. 8852, File No. BP-6627; for construction permits.

At a session of the Federal Communications Commission held at its offices in Washington, D. C. on the 18th day of March 1948;

The Commission having under consideration the above-entitled applica-

tions of Albert Brightman Buffington, Edward Truman, Samuel J. Roley and Roger C. Patrick, a partnership d/b as Voice of the Valley Company, requesting authorization to construct a new standard broadcast station to operate on 890 kc [U. S. Class I (a)], with 250 w power, daytime only; Leland Holzer, requesting 890 kc, with 1 kw power, daytime only, at Los Angeles, California; William Odessky and Lee A. Odessky, a partnership d/b as William and Lee Odessky, requesting 900 kc, with 250 w power, daytime only at Los Angeles; and Essie Binkley West, requesting 900 kc, with 1 kw power, daytime only using directional antenna, at Riverside, California;

It appearing, that pursuant to the Commission's announced policy, the applications of Voice of the Valley Company and Leland Holzer, requesting daytime operation on a U. S. clear channel frequency, have been placed in the pending file to await a decision in the clear channel hearing; and

It further appearing, that the said applications involve prohibitive interference with the applications of William and Lee Odessky, and Essie Binkley West, requesting authorization to operate on an adjacent channel in the same area;

It is ordered, That, pursuant to section 309 (a) of the Communications Act of 1934, as amended, the above-entitled applications, be, and they are hereby designated for hearing in a consolidated proceeding at a time and place to be designated by subsequent order of the Commission upon the following issues:

1. To determine the legal, technical, financial, and other qualifications of the individual applicants and of the applicant partnerships and the partners to construct and operate the proposed stations.

2. To determine the areas and populations which may be expected to gain or lose primary service from the operation of the proposed stations and the character of other broadcast service available to those areas and populations.

3. To determine the type and character of program service proposed to be rendered and whether it would meet the requirements of the populations and areas proposed to be served.

4. To determine whether the operation of the proposed stations would involve objectionable interference with stations KHJ, Los Angeles and KIEV, Glendale, California, or with any other existing broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

5. To determine whether the operation of the proposed stations would involve objectionable interference, each with the other, with the services proposed in any other pending applications for broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

6. To determine whether the installation and operation of the proposed stations would be in compliance with the Commission's rules and Standards of

Good Engineering Practice Concerning Standard Broadcast Stations.

7. To determine on a comparative basis which, if any, of the applications in this consolidated proceeding should be granted.

It is further ordered, That Thomas S. Lee Enterprises, Inc., d/b as Don Lee Broadcasting System, licensee of Station KMJ, Los Angeles and Cannon System, Ltd., licensee of Station KIEV, Glendale, California, be, and they are hereby, made parties to this consolidated proceeding.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2827; Filed, Mar. 30, 1948;
8:54 a. m.]

[Docket Nos. 8854, 8855]

CENTER BROADCASTING CO. AND SHELBY BROADCASTING CO.

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of Tom Potter and Tom E. Foster, d/b as Center Broadcasting Company, Center, Texas, Docket No. 8854, File No. BP-6511; Shelby Broadcasting Company, a partnership consisting of O. L. Parker and A. C. Childs, Center, Texas, Docket No. 8855, File No. BP-6572; for construction permits.

At a session of the Federal Communications Commission held at its offices in Washington, D. C., on the 18th day of March 1948;

The Commission having under consideration the above-entitled applications of Tom Potter and Tom E. Foster, d/b as Center Broadcasting Company, requesting authorization to construct a new standard broadcast station to operate on 1490 kc, with 250 w power, unlimited time at Center, Texas, and Shelby Broadcasting Company, a partnership, consisting of O. L. Parker and A. C. Childs requesting the same facilities;

It is ordered, That, pursuant to Section 309 (a) of the Communications Act of 1934, as amended, the said applications of Center Broadcasting Company and Shelby Broadcasting Company be, and they are hereby, designated for hearing in a consolidated proceeding at a time and place to be designated by subsequent order of the Commission, upon the following issues:

1. To determine the legal, technical, financial, and other qualifications of the applicant partnerships and the partners to construct and operate the proposed stations.

2. To determine the areas and populations which may be expected to gain or lose primary service from the operation of the proposed stations and the character of other broadcast service available to those areas and populations.

3. To determine the type and character of program service proposed to be rendered and whether it would meet the requirements of the populations and areas proposed to be served.

4. To determine whether the operation of the proposed stations would involve

objectionable interference with any existing broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

5. To determine whether the operation of the proposed stations would involve objectionable interference with the services proposed in any other pending applications for broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

6. To determine whether the installation and operation of the proposed stations would be in compliance with the Commission's rules and Standards of Good Engineering Practice Concerning Standard Broadcast Stations.

7. To determine on a comparative basis which, if either, of the applications in this consolidated proceeding should be granted.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2829; Filed, Mar. 30, 1948;
8:54 a. m.]

[Docket Nos. 8856, 8857]

NORTHAMPTON BROADCASTING CO. AND ROBERT C. HODGKINS

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of Paul E. Higgins, William F. Higgins and Harwood Burritt, a partnership d/b as Northampton Broadcasting Company, Northampton, Massachusetts, Docket No. 8856, File No. BP-5594; Robert C. Hodgkins, Northampton, Massachusetts, Docket No. 8857, File No. BP-6584; for construction permits.

At a session of the Federal Communications Commission held at its offices in Washington, D. C. on the 18th day of March 1948;

The Commission having under consideration the above-entitled applications of Paul E. Higgins, William F. Higgins and Harwood Burritt, a partnership d/d as Northampton Broadcasting Company, and Robert C. Hodgkins, each requesting authorization to construct a new standard broadcast station to operate on 1570 kc, with 250 w power, daytime only at Northampton, Massachusetts;

It is ordered, That, pursuant to section 309 (a) of the Communications Act of 1934, as amended, the said applications of Northampton Broadcasting Company and Robert C. Hodgkins, be, and they are hereby, designated for hearing in a consolidated proceeding at a time and place to be designated by subsequent order of the Commission, upon the following issues:

1. To determine the legal, technical, financial and other qualifications of the individual applicant and of the applicant partnership and the partners to construct and operate the proposed stations.

2. To determine the areas and populations which may be expected to gain or lose primary service from the operation of the proposed stations and the character of other broadcast service available to those areas and populations.

3. To determine the type and character of program service proposed to be rendered and whether it would meet the requirements of the populations and areas proposed to be served.

4. To determine whether the operation of the proposed stations would involve objectionable interference with any existing broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

5. To determine whether the operation of the proposed stations would involve objectionable interference with the services proposed in any other pending applications for broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

6. To determine whether the installation and operation of the proposed stations would be in compliance with the Commission's rules and Standards of Good Engineering Practice Concerning Standard Broadcast Stations.

7. To determine on a comparative basis which, if either, of the applications in this consolidated proceeding should be granted.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2830; Filed, Mar. 30, 1948;
8:54 a. m.]

[Docket Nos. 8858, 8859]

YORK COUNTY BROADCASTING CO. AND
BIDDEFORD BROADCASTING CORP.

ORDER DESIGNATING APPLICATIONS FOR CONSOLIDATED HEARING ON STATED ISSUES

In re applications of Bernard K. Johnpoll, tr/as York County Broadcasting Company, Biddeford, Maine, Docket No. 8858, File No. BP-6509; Biddeford Broadcasting Corporation, Biddeford, Maine, Docket No. 8859, File No. BP-6601; for construction permits.

At a session of the Federal Communications Commission held at its offices in Washington, D. C. on the 18th day of March 1948;

The Commission having under consideration the above-entitled applications of Bernard K. Johnpoll, tr/as York County Broadcasting and Biddeford Broadcasting Corporation, each requesting authorization to construct a new standard broadcast station to operate on 1400 kc, with 250 w power, unlimited time at Biddeford, Maine;

It is ordered, That, pursuant to section 309 (a) of the Communications Act of 1934 as amended, the said applications of York County Broadcasting Company and Biddeford Broadcasting Corporation be, and they are hereby, designated

for hearing in a consolidated proceeding at a time and place to be designated by subsequent order of the Commission, upon the following issues:

1. To determine the legal, technical, financial, and other qualifications of the individual applicant and of the applicant corporation, its officers, directors and stockholders to construct and operate the proposed stations.

2. To determine the areas and populations which may be expected to gain primary service from the operation of the proposed stations and the character of other broadcast service available to those areas and populations.

3. To determine the type and character of program services proposed to be rendered and whether it would meet the requirements of the populations and areas proposed to be served.

4. To determine whether the operation of the proposed stations would involve objectionable interference with any existing broadcast stations and, if so, the nature and extent thereof, the areas and populations affected thereby and the availability of other broadcast service to such areas and populations.

5. To determine whether the operation of the proposed stations would involve objectionable interference with the services proposed in any other pending applications for broadcast facilities and, if so, the nature and extent thereof, the areas and populations affected thereby, and the availability of other broadcast service to such areas and populations.

6. To determine whether the installation and operation of the proposed stations would be in compliance with the Commission's rules and Standards of Good Engineering Practice Concerning Standard Broadcast Stations.

7. To determine on a comparative basis which, if either, of the applications in this consolidated proceeding should be granted.

By the Commission.

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2831; Filed, Mar. 30, 1948;
8:55 a. m.]

WEST CENTRAL BROADCASTING CO.

PUBLIC NOTICE CONCERNING PROPOSED
TRANSFER OF CONTROL¹

The Commission hereby gives notice that on February 27, 1948 there was filed with it an application (Btc-624) for its consent under section 310 (b) of the Communications Act to the proposed transfer of control of West Central Broadcasting Company licensee of WEEK, Peoria, Illinois, from E. K. Gaylord and four other stockholders to Robert S. Kerr and five other stockholders. The proposal to transfer control arises out of a contract of February 19, 1948 between the above named parties pursuant to which the selling stockholders would sell to the purchasers a total of 750 shares (50%) of the out-

¹ Section 1.321, Part 1, Rules of Practice and Procedure.

standing stock of the licensee for a cash consideration of \$37,500 plus a sum equal to one-half of the net quick assets of the corporation at the transfer date. The purchasers are also to effect a loan of \$150,000 and to cause the company to pay its note in that amount held by Liberty National Bank of Oklahoma City, Oklahoma, or in lieu thereof obtain from said bank a release of the sellers concerning their obligation in connection with said note. If the company receives \$10,000 arising out of the granting of an application by All Oklahoma Broadcasting Company sellers are to receive \$5,000. Further information as to the arrangements may be found with the application and associated papers which are on file at the offices of the Commission in Washington, D. C.

Pursuant to § 1.321 which sets out the procedure to be followed in such cases including the requirement for public notice concerning the filing of the application, the Commission was advised by applicant on March 17, 1948 that starting on March 19, 1948 notice of the filing of the application would be inserted in a newspaper of general circulation at Peoria, Illinois, in conformity with the above section.

In accordance with the procedure set out in said section, no action will be had upon the application for a period of 60 days from March 19, 1948 within which time other persons desiring to apply for the facilities involved may do so upon the same terms and conditions as set forth in the above described contract.

(Sec. 310 (b), 48 Stat. 1086; 47 U. S. C. 310 (b))

FEDERAL COMMUNICATIONS
COMMISSION,

[SEAL]

T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2850; Filed, Mar. 30, 1948;
8:56 a. m.]

KFNF

PUBLIC NOTICE CONCERNING PROPOSED
ASSIGNMENT OF LICENSE¹

The Commission hereby gives notice that on March 16, 1948 there was filed with it an application (BAL-708) for its consent under section 310 (b) of the Communications Act to the proposed assignment of license of KFNF, Shenandoah, Iowa from KFNF, Inc. to Capital Broadcasting Company, Lincoln, Nebraska. The proposal to assign the license arises out of a contract of January 21, 1948 pursuant to which the station and all its facilities and properties (but not including the real estate owned by KFNF, Inc.) would be sold to Capital Broadcasting Company for a total consideration of \$120,000. Of this amount \$5,000 in cash was paid upon execution of the agreement, \$30,000 will be paid upon Commission approval and the remaining \$85,000 would be evidenced by assignee's 5% notes payable at a rate of \$17,000 per year. Said notes would be endorsed by the six directors of assignee. Purchaser as at the same time entered into an agreement with Henry Field Seed Com-

pany under which the Seed Company would utilize certain time over the station for a period of 12 months for \$833 a month. Further information as to the arrangements may be found with the application and associated papers which are on file at the offices of the Commission in Washington, D. C.

Pursuant to § 1.321 which sets out the procedure to be followed in such cases including the requirement for public notice concerning the filing of the application, the Commission was advised by applicant on March 16, 1948 that starting on March 23, 1948 notice of the filing of the application would be inserted in a newspaper of general circulation at Shenandoah, Iowa in conformity with the above section.

In accordance with the procedure set out in said section, no action will be had upon the application for a period of 60 days from March 23, 1948 within which time other persons desiring to apply for the facilities involved may do so upon the terms and conditions as set forth in the above described contract.

(Sec. 310 (b), 48 Stat. 1086; 47 U. S. C. 310 (b))

FEDERAL COMMUNICATIONS
COMMISSION,

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2851; Filed, Mar. 30, 1948;
8:57 a. m.]

WIGM

PUBLIC NOTICE CONCERNING PROPOSED
ASSIGNMENT OF LICENSE¹

The Commission hereby gives notice that on March 18, 1948 there was filed with it an application (BAL-709) for its consent under section 310 (b) of the Communications Act to the proposed assignment of license of WIGM, Medford, Wisconsin from Dairyland's Broadcasting Service, Inc. to George F. Meyer, Medford, Wisconsin. The proposal to assign the license arises out of a contract of March 6, 1948 pursuant to which all the facilities and properties of the station would be sold to the above indicated assignee in return for which said assignee would surrender all his 200 shares of \$100 par value common voting stock (\$20,000) and would pay in addition thereto \$10,000 upon completion of the transfer. Assignee is to be relieved of liability as indorsee on certain obligations of the licensee. As further consideration all profits from January 1, 1948 to the date of the execution of instruments conveying the properties shall belong to the company. Further information as to the arrangements may be found with the application and associated papers which are on file at the offices of the Commission in Washington, D. C.

Pursuant to § 1.321 which sets out the procedure to be followed in such cases including the requirement for public notice concerning the filing of the application, the Commission was advised by applicant on March 18, 1948 that starting

on March 25, 1948 notice of the filing of the application would be inserted in the Marshfield News Herald, a newspaper of general circulation at Marshfield, Wisconsin, in conformity with the above section.

In accordance with the procedure set out in said section, no action will be had upon the application for a period of 60 days from March 25, 1948 within which time other persons desiring to apply for the facilities involved may do so upon the same terms and conditions as set forth in the above described contract.

(Sec. 310 (b), 48 Stat. 1086; 47 U. S. C. 310 (b))

FEDERAL COMMUNICATIONS
COMMISSION,

[SEAL] T. J. SLOWIE,
Secretary.

[F. R. Doc. 48-2852; Filed, Mar. 30, 1948;
8:57 a. m.]

FEDERAL POWER COMMISSION

[Docket No. G-1016]

OHIO FUEL GAS CO.

NOTICE OF APPLICATION

MARCH 25, 1948.

Notice is hereby given that on March 15, 1948, an application was filed with the Federal Power Commission by The Ohio Fuel Gas Company (Applicant), an Ohio Corporation with its principal office at Columbus, Ohio, for:

(a) A certificate of public convenience and necessity pursuant to section 7 of the Natural Gas Act, as amended, authorizing the construction and operation of the following-described natural-gas facilities in the State of Ohio:

A total of approximately 97 miles of transmission pipeline consisting of approximately 28 miles of 20-inch O. D. pipe; 19 miles of 16-inch O. D. pipe, with 8-inch O. D. pipe connection to Marion, and 50 miles of 12¾-inch O. D. pipe located generally between the Treat Compressor Station of Applicant in Licking County and extending to the connection of Applicant with West Ohio Gas Company in Allen County supplying the markets of Lima, Kenton, Delphos, Ottawa, Leipsic, etc.

(b) An order approving and permitting the abandonment and removal of the following-described facilities in Ohio pursuant to section 7 (b) of the Natural Gas Act, as amended:

(i) Approximately 36 miles of Lines "D" and "D-4" consisting of 8-inch, 10-inch, 12-inch and 16-inch transmission pipelines of the Applicant running north-westward from the Treat Compressor Station to Mt. Gilead supplying, among other places, Cardington, part of Marion and as capacity permits, supplying Gallion, Bucyrus and other areas.

(ii) Approximately 82 miles of Applicant's line L-400 which was constructed in 1907 extending generally from Mansfield through the Wyandot Compressor Station to the connection between Applicant and West Ohio Gas Company for service to Lima, Kenton, Delphos, Ottawa, Leipsic, etc., together with the 525 H. P. Wyandot Compressor Station.

Applicant states that the portions of Lines "D", "D-4" and "L-400" above described which are proposed to be abandoned and removed are inadequate to supply the demands of the markets connected to said lines. Applicant requests authority to construct and operate new facilities of larger size and capacity designed to meet the natural-gas requirements of the markets now connected to Applicant's system. Applicant further states that the proposed new facilities will improve and protect service rendered directly by Applicant to 17 communities served at retail and two utility companies served at wholesale. Applicant states that no additional markets are sought to be served.

Applicant estimates that the present natural-gas requirements of this area now served by Lines "D", "D-4" and L-400 are 20.1 million cubic feet on a zero degree day which requirements are beyond the capacity of the present facilities and because of such needs, curtailments in service have been made during the periods of high demand. Frequent restriction of deliveries to industrial and commercial consumers has occurred during the 1947-48 winter season with a maximum daily curtailment of approximately three million cubic feet in the Lima area alone. Applicant estimates that the 1951 peak day requirements of these markets to be served entirely from the proposed lines will be 34.7 million cubic feet.

Applicant states that the replacement of a portion of Line "D" by construction of approximately 28 miles of 20-inch O. D. pipeline capable of operating at higher pressures, and the construction of 19 miles of 16-inch O. D. line from Mt. Gilead to Marion will provide capacity to supply the full requirements of the Marion and Lima groups of markets in addition to continuing and improving service to the present markets on the existing "D" system north of Mt. Gilead. A connection between the new 16-inch line and Marion will permit removal of a portion of Line D-4, the balance being retained in service as a supply line to the town of Caledonia. After completion of proposed facilities, necessary changes in market connections and measuring and regulating equipment, Wyandot station and Line "L-400" from Mansfield to Lima will be retired from service.

The total estimated over-all capital cost of the proposed facilities is \$2,968,250, which will be financed out of funds provided by Columbia Gas & Electric Corporation, the company owning the controlling interest in applicant. Applicant states that there will be no new proposed rates and no additional sales or revenues except to the extent that greater volumes of natural gas are sold to presently connected markets.

Any interested State commission is requested to notify the Federal Power Commission whether the application should be considered under the cooperative provisions of Rule 37 of the Commission's rules of practice and procedure (18 CFR 1.37) and, if so, to advise the Federal Power Commission as to the nature of its interest in the matter and whether it desires a conference, the creation of a

¹ Section 1.321, Part 1, Rules of Practice and Procedure.

board, or a joint or concurrent hearing, together with reasons for such a request.

The application of The Ohio Fuel Gas Company is on file with the Commission and open to public inspection. Any person desiring to be heard or to make any protest with reference to the application shall file with the Federal Power Commission, Washington 25, D. C., not later than 15 days from the date of publication of this notice in the FEDERAL REGISTER, a petition to intervene or protest. Such petition or protest shall conform to the requirements of Rule 8 or 10, whichever is applicable, of the rules of practice and procedure (as amended on June 16, 1947) (18 CFR 1.8 or 1.10).

[SEAL] LEON M. FUQUAY,
Secretary.

[F. R. Doc. 48-2812; Filed, Mar. 30, 1948;
8:49 a. m.]

[Docket No. G-984]

KANSAS-NEBRASKA NATURAL GAS CO., INC.
ORDER FIXING DATE OF HEARING

MARCH 25, 1948.

Upon consideration of the application filed December 19, 1947, by Kansas-Nebraska Natural Gas Company, Inc., (Applicant), a Kansas corporation having its principal place of business at Phillipsburg, Kansas, for a certificate of public convenience and necessity pursuant to section 7 of the Natural Gas Act, as amended, authorizing the construction and operation of certain natural-gas facilities, subject to the jurisdiction of the Commission, as fully described in such application on file with the Commission and open to public inspection, public notice thereof having been given, including publication in the FEDERAL REGISTER on January 15, 1948 (13 F. R. 201-202).

The Commission orders that:

(A) Pursuant to the authority contained in and subject to the jurisdiction conferred upon the Federal Power Commission by sections 7 and 15 of the Natural Gas Act, as amended, and the Commission's rules of practice and procedure, a public hearing be held commencing on April 15, 1948, at 10:00 a. m. (e. s. t.) in the hearing room of the Federal Power Commission, 1800 Pennsylvania Avenue NW., Washington, D. C., concerning the matters involved and the issues presented by the application and other pleadings in this proceeding.

(B) Prior to the date herein fixed for the commencement of the public hearing, the officer designated by the Commission to preside at the public hearing shall hold a prehearing conference of all parties participating in the proceeding concerning the matters of fact and law asserted in the application and other pleadings filed in the proceeding, for the purposes of settling, simplifying or limiting the issues and further apprising the parties of the formulated or stipulated issues upon which evidence must be adduced at the public hearing: *Provided, however,* That no party shall be denied the right to examine or cross-examine on other matters, where additional issues

develop during the course of the hearing. Such prehearing conference shall be held commencing on April 13, 1948, at 10:00 a. m. (e. s. t.) at the offices of the Commission, 1800 Pennsylvania Avenue NW., Washington, D. C.

(C) Interested State commissions may participate as provided by Rules 8 and 37 (f) (18 CFR 1.8 and 1.37 (f)) of the said rules of practice and procedure.

Date of issuance: March 26, 1948.

By the Commission.

[SEAL] LEON M. FUQUAY,
Secretary.

[F. R. Doc. 48-2818; Filed, Mar. 30, 1948;
8:50 a. m.]

SECURITIES AND EXCHANGE COMMISSION

[File No. 1-858]

DEVONIAN OIL CO.

NOTICE OF APPLICATION TO WITHDRAW FROM LISTING AND REGISTRATION, AND OF OPPORTUNITY FOR HEARING

At a regular session of the Securities and Exchange Commission, held at its office in the city of Washington, D. C., on the 25th day of March A. D. 1948.

Devonian Oil Company, pursuant to section 12 (d) of the Securities Exchange Act of 1934 and Rule X-12D2-1 (b) promulgated thereunder, has made application to withdraw its common stock, \$10.00 par value, from listing and registration on the Pittsburgh Stock Exchange.

The application alleges that (1) at the close of business on March 3, 1948, Warren Petroleum Corporation and Gulf Oil Corporation owned 316,203 shares of the 322,000 outstanding shares of common stock of Devonian Oil Company, the applicant; (2) these shares that have been acquired by Warren Petroleum Corporation and Gulf Oil Corporation were purchased on March 2 and 3, 1948 at \$65.00 per share; (3) this price is in excess of the prices at which these shares have recently been traded on the Pittsburgh Stock Exchange; (4) the price of \$65.00 per share is being offered by Warren Petroleum Corporation and Gulf Oil Corporation for the remaining outstanding shares of applicant; (5) the only shares remaining outstanding, except for 382 shares in escrow, are 5,415 shares owned by approximately 95 stockholders; (6) it is no longer desirable to have this security registered and listed on the Pittsburgh Stock Exchange because the Warren Petroleum Corporation and Gulf Oil Corporation own 316,203 shares of the outstanding 322,000 shares of common stock; and (7) there are no provisions in the constitution, by-laws or rules of the Pittsburgh Stock Exchange relating to the application for withdrawal of securities listed on this exchange.

Upon receipt of a request, prior to April 8, 1948, from any interested person for a hearing in regard to terms to be imposed upon the delisting of this security, the Commission will determine whether to set the matter down for hearing. Such request should state briefly the nature of the interest of the per-

son requesting the hearing and the position he proposes to take at the hearing with respect to imposition of terms or conditions. In addition, any interested person may submit his views or any additional facts bearing on this application by means of a letter addressed to the Secretary of the Securities and Exchange Commission, Washington, D. C. If no one requests a hearing on this matter, this application may be determined by order of the Commission on the basis of the facts stated in the application, and other information contained in the official file of the Commission pertaining to this matter.

By the Commission.

[SEAL] NELLYE A. THORSEN,
Assistant to the Secretary.

[F. R. Doc. 48-2809; Filed, Mar. 30, 1948;
8:53 a. m.]

[File No. 31-550]

CHEMICAL BANK & TRUST CO.

ORDER GRANTING APPLICATION

At a regular session of the Securities and Exchange Commission, held at its office in the city of Washington, D. C., on the 23d day of March A. D. 1948.

The Commission having entered an order on December 24, 1947, approving, pursuant to section 11 (e) of the Public Utility Holding Company Act of 1935, a plan ("Alternate Plan") for the reorganization of Interstate Power Company ("Interstate"), a registered holding company (Holding Company Act Release No. 7955, File No. 54-130); and said alternate plan providing, among other things, for (1) the issue and sale by Interstate of so many shares, not exceeding 1,500,000 shares, of its new common stock as may be required to provide Interstate with \$3,635,500, being an amount sufficient, when added to the \$20,000,000 principal amount of new bonds and \$5,000,000 principal amount of new debentures to be issued and sold under said alternate plan, to enable Interstate to retire its presently outstanding first mortgage bonds and reimburse its treasury for new construction expenditures, and (2) the deposit in escrow with Chemical Bank & Trust Company ("Chemical"), as Escrow Agent, of the entire balance of said 1,500,000 new common shares remaining unsold, for the benefit of the holders of Interstate's presently outstanding 6% debentures, 6% demand note, and preferred stocks, and the issuance of escrow certificates to each of such security holders evidencing their contingent interest in such escrowed new common stock; voting privileges in respect of such escrowed common stock to be vested in Chemical, who will vote the stock in the exclusive behalf; and in accordance with the express directions of, the registered holders of Debenture Escrow Certificates:

The Commission having stated in the margin of its supplemental findings and opinion of December 24, 1947 as follows:

The acquisition by the Escrow Agent of shares of the new common stock of Interstate might bring it within the technical

definition of a holding company contained in section 2 (a) (7) (A) of the act. If so, it appears under the circumstances of this case that the escrow agent upon proper application to the Commission would be entitled to an order declaring it not to be a holding company under the standards specified in section 2 (a) (7);.

Chemical having filed an application pursuant to section 2 (a) (7) of the act for an order declaring it not to be a holding company in the event that upon consummation of said alternate plan there is deposited in escrow with Chemical 10% or more of the outstanding new common stock of Interstate;

The Commission having considered said application, and deeming it neither necessary nor appropriate in the public interest or for the protection of investors or consumers that the applicant be subject to the obligations, duties, and liabilities imposed by the act upon holding companies, in the event that it acquires, as Escrow Agent, more than 10% of the outstanding new common stock of Interstate;

It is ordered, Pursuant to section 2 (a) (7) of the act that the application herein, on the premises set forth above, be, and the same hereby is, granted.

By the Commission.

[SEAL] ORVAL L. DuBois,
Secretary.

[F. R. Doc. 48-2800; Filed, Mar. 30, 1948;
8:48 a. m.]

[File No. 54-130]

INTERSTATE POWER CO. AND OGDEN CORP.
SUPPLEMENTAL ORDER PERMITTING AMENDED
DECLARATION TO BECOME EFFECTIVE

At a regular session of the Securities and Exchange Commission, held at its office in the city of Washington, D. C., on the 23d day of March A. D. 1948.

The Commission having entered an order on December 24, 1947 (Holding Company Act Release No. 7955) approving, pursuant to section 11 (e) of the Public Utility Holding Company Act of 1935, a plan of reorganization ("alternate plan") of Interstate Power Company ("Interstate"), such plan providing, among other things, for the following transactions:

(i) The issue and sale by Interstate of \$20,000,000 principal amount of first mortgage bonds, --%, Series, due 1978;

(ii) The issue and sale by Interstate of \$5,000,000 principal amount of debentures, --% Series, due 1968;

(iii) The issue and sale by Interstate of so many shares of its new common stock with a par value of \$3.50 per share, not exceeding 1,500,000 shares, as may be required to provide Interstate with \$3,635,500 (or, if said amount of \$3,635,500 shall not be exactly divisible by the net price per share, then the least greater amount that shall be exactly so divisible), and

The District Court of the United States for the District of Delaware having entered an order on January 7, 1948, approving said alternate plan, subject to the terms and conditions of the Com-

mission's order of December 24, 1947; and

The Commission's order of December 24, 1947 having contained a reservation of jurisdiction to consider the following matter, among others:

(b) The prices and spreads pertaining to the proposed sale of new First Mortgage Bonds, new debentures, and shares of new common stock * * *;

and

Interstate having filed with the Commission an amendment to its declaration relating to the proposed sale of said securities, said amendment stating, among other things, that on March 23, 1948, Interstate executed and delivered to Smith, Barney & Co., subject to the Commission's approval thereof, agreements relating to the proposed sales by Interstate of said new first mortgage bonds, new debentures, and shares of new common stock, said agreements setting forth, among other things, the following information concerning said proposed sales:

	Coupon rate	Price to Interstate	Price to public	Underwriting spread	Cost of money to Interstate
	Per-cent				Per-cent
First mortgage bonds.....	3 3/4	101.72	102.72	1.00	3.655
Debentures.....	4 3/4	99.00	100.00	1.00	4.830
Common stock (655,039 shares).....		6.55	7.35	.80	

Said amendment further proposing certain changes in the indenture relating to Interstate's debentures whereby, among other things, the unsecured debentures previously proposed under the alternate plan will be changed to secured debentures secured by a lien on Interstate's property junior to the lien of Interstate's proposed new first mortgage bonds; and

A public hearing having this day been held to consider these matters, and notice having been given in accordance with the provisions of our order of February 12, 1948, at which all interested persons were granted an opportunity to be heard, and the Commission having considered the record herein; and

It appearing that the issuance and sale of Interstate's new common stock at the price proposed to be paid to Interstate will effectuate a plan which will be fair and equitable to the persons affected:

It is ordered, That Interstate's declaration, as amended, in respect of the proposed sales of new first mortgage bonds, new debentures, and shares of new common stock be, and the same hereby is, permitted to become effective forthwith, and that jurisdiction heretofore reserved with respect to the fees of counsel for the underwriters in connection with said sales be, and hereby is, released.

It is further ordered, That jurisdiction with respect to the terms and conditions contained in the indenture securing Interstate's new Secured Debentures be, and is hereby, released.

It is further ordered, That the reservations of jurisdiction, not heretofore

released, with respect to all the other matters set forth in the Commission's order of December 24, 1947, be continued.

By the Commission.

[SEAL] ORVAL L. DuBois,
Secretary.

[F. R. Doc. 48-2004; Filed, Mar. 30, 1948;
8:52 a. m.]

[File No. 70-1331]

AMERICAN POWER & LIGHT CO. ET AL.

ORDER RELEASING JURISDICTION OVER
PAYMENT OF CERTAIN LEGAL FEES

At a regular session of the Securities and Exchange Commission, held at its office in the city of Washington, D. C., on the 23d day of March A. D. 1948.

In the matter of American Power & Light Company Pacific Power & Light Company, and Northwestern Electric Company; File No. 70-1331.

The Commission having by order dated April 24, 1947 granted certain amended applications and permitted to become effective certain amended declarations filed by American Power & Light Company ("American"), a registered holding company subsidiary of Electric Bond and Share Company, also a registered holding company, and Pacific Power & Light Company ("Pacific") and Northwestern Electric Company ("Northwestern"), electric utility subsidiaries of American regarding (a) certain capital contributions by American to Northwestern and Pacific; (b) the merger of Northwestern into and with Pacific; (c) the retirement of the then outstanding preferred stocks of Northwestern and Pacific through the issuance in exchange therefor by Pacific, as the surviving corporation, of new preferred stock and by specified cash payments; and (d) the issuance by Pacific, as the surviving corporation, of new common stock to American in exchange for the common stocks of Northwestern and Pacific held by American; and

Said order of April 24, 1947, having contained a reservation of jurisdiction over the payment by Pacific, as the surviving corporation, of fees proposed to be paid the law firm of Davis, Polk, Wardwell, Sunderland & Kiendl for services in connection with the proposed transactions; said law firm having submitted additional evidence with respect to the services rendered in these proceedings; and said law firm and Pacific having agreed upon the payment of a fee of \$7,500, subject to this Commission's order; and

The Commission having examined said additional evidence and finding that the proposed payment of a fee to the firm of Davis, Polk, Wardwell, Sunderland & Kiendl in the amount of \$7,500 is not unreasonable and finding it is appropriate in the public interest to release jurisdiction over the payment of such fee:

It is ordered, That jurisdiction heretofore reserved over the fees proposed to be paid the law firm of Davis, Polk, Wardwell, Sunderland & Kiendl for services rendered in connection with these proceedings be, and the same hereby is, released.

It is further ordered, That said order of April 24, 1947, is, except as herein expressly modified, continued in full force and effect.

By the Commission.

[SEAL] ORVAL L. DuBOIS,
Secretary.

[F. R. Doc. 48-2806; Filed, Mar. 30, 1948;
8:53 a. m.]

[File Nos. 70-1689, 70-1733]

PUBLIC SERVICE CO. OF NEW HAMPSHIRE
AND NEW ENGLAND PUBLIC SERVICE CO.

ORDER GRANTING AND PERMITTING APPLICATION AND DECLARATION TO BECOME EFFECTIVE

At a regular session of the Securities and Exchange Commission, held at its office in the city of Washington, D. C., on the 10th day of March A. D. 1948.

Public Service Company of New Hampshire ("New Hampshire"), a public utility subsidiary of New England Public Service Company ("NEPSCO"), a registered holding company, and a subsidiary of Northern New England Company, also a registered holding company, having filed an application, and amendments thereto, pursuant to section 6 (b) of the Public Utility Holding Company Act of 1935, requesting an exemption from the competitive bidding requirements of Rule U-50, with respect to the issuance and sale of 199,627 shares of additional common stock, \$10 par value, through the medium of the issuance of subscription warrants to holders of New Hampshire's outstanding common stock in accordance with their preemptive rights and the sale to underwriters of unsubscribed shares of the new common stock; and

NEPSCO having filed an application pursuant to Sections 9 and 10 of said act, and a declaration pursuant to section 12 (d) of said act, requesting permission, if necessary, to acquire the subscription warrants for said stock to which it will be entitled by virtue of its preemptive rights as a stockholder of New Hampshire and to sell them to underwriters during the subscription period; and

Northern New England Company having requested approval, if necessary, with respect to its acquisition of subscription warrants for said common stock to which Northern New England Company will be entitled by virtue of its preemptive rights as a stockholder of New Hampshire, and the sale of such warrants to underwriters during the subscription period; and

A public hearing having been held after appropriate notice, briefs and a reply brief having been filed, and the Commission having made an independent review of the record and having this day issued its findings and opinion herein;

It is ordered, On the basis of said findings and opinion, that said applications and declaration as amended, and the request of Northern New England Company, be and the same are hereby granted and permitted to become effective, subject, however, to the terms and conditions prescribed in Rule U-24 and

to the further condition that jurisdiction be reserved with respect to the price to be paid for the stock and the subscription warrants, underwriters' commissions and the allocation thereof, and all fees and expenses relating to the said issue and sale of additional common stock and subscription warrants; and

It is further ordered, That the proposed issue and sale by New Hampshire of additional shares of common stock be and they are hereby exempted from the provisions of Rule U-50.

By the Commission.

[SEAL] ORVAL L. DuBOIS,
Secretary.

[F. R. Doc. 48-2808; Filed, Mar. 30, 1948;
8:53 a. m.]

[File No. 70-1721]

ILLINOIS POWER CO.

ORDER RELEASING JURISDICTION WITH
RESPECT TO FEES AND EXPENSES

At a regular session of the Securities and Exchange Commission held at its office in the city of Washington, D. C. on the 23d day of March 1948.

The Commission having, by order dated February 9, 1948, permitted to become effective a declaration, as amended, filed by Illinois Power Company ("Illinois"), a registered holding company and a public utility company, pursuant to sections 6 (a) and 7 of the Public Utility Holding Company Act of 1935, regarding the issuance and sale by Illinois, pursuant to the competitive bidding requirements of Rule U-50, of \$15,000,000 principal amount of First Mortgage Bonds 3½% Series, due 1978, and said order having provided, among other things, that jurisdiction be reserved with respect to the payment of legal and auditors' fees and expenses in connection with said transaction; and

The Commission having by order dated February 17, 1948, released jurisdiction with respect to the matters to be determined as a result of competitive bidding for said new bonds, jurisdiction having been continued with respect to the said fees and expenses; and

Statements and affidavits having been furnished the Commission regarding the nature and extent of services rendered for which fees and expenses are requested as follows:

	Fees	Expenses
Pam, Hurd & Reichmann, counsel for Illinois.....	\$15,000	\$750.53
Bell, Boyd & Marshall, counsel for successful bidder.....	9,000	1319.94 129.09
Price, Waterhouse & Co., auditors' services.....	7,500	1,224.33

¹ To be paid by successful bidder.

² To be paid by Illinois in connection with "blue sky" matters.

It appearing to the Commission, after due consideration, that, under the circumstances of this matter, such fees and expenses are not unreasonable and jurisdiction should be released with respect thereto:

It is ordered, That the jurisdiction heretofore reserved in the orders of February 9, 1948 and February 17, 1948, with respect to the payment of legal and auditors' fees and expenses in this matter, be, and the same hereby is, released.

By the Commission.

[SEAL] ORVAL L. DuBOIS,
Secretary.

[F. R. Doc. 48-2807; Filed, Mar. 30, 1948;
8:53 a. m.]

[File No. 70-1737]

WEST PENN POWER CO. AND WEST PENN
ELECTRIC CO.

SUPPLEMENTAL ORDER GRANTING AND PERMITTING JOINT APPLICATION-DECLARATION TO BECOME EFFECTIVE

At a regular session of the Securities and Exchange Commission, held at its office in the city of Washington, D. C., on the 23d day of March A. D. 1948.

The West Penn Electric Company ("West Penn Electric"), a registered holding company, and West Penn Power Company ("West Penn Power"), a direct subsidiary of West Penn Electric, having filed a joint application-declaration with the Commission pursuant to the Public Utility Holding Company Act of 1935 regarding, among other things: (a) The issuance and sale by West Penn Power, at competitive bidding pursuant to Rule U-50, of \$12,000,000 principal amount of first mortgage bonds and 50,000 shares of preferred stock, par value \$100 per share, the price to West Penn Power for such securities, the interest rate on the bonds, the dividend rate on the preferred stock, and the compensation to the successful bidders for underwriting the preferred stock all to be determined at competitive bidding; and (b) the issuance and sale by West Penn Power to West Penn Electric and the acquisition by West Penn Electric, subject to the preemptive rights of the public holders of a portion of the outstanding common stock of West Penn Power to purchase approximately 5.41% of new common stock, of additional shares of its common stock without nominal or par value in an amount sufficient to generate cash of approximately \$2,500,000, the subscription price for this new common stock to be set by West Penn Power after the results of competitive bidding for its bonds and preferred stock have been ascertained;

The Commission having by order, entered herein under the date of March 15, 1948, granted and permitted effectiveness to the joint application-declaration, as amended, subject, among other things, to the condition that the proposed issuance and sale of these securities should not be consummated until the results of competitive bidding had been made a matter of record in this proceeding and a further order entered by the Commission in the light of the record so completed;

West Penn Power and West Penn Electric having filed an amendment to the joint application-declaration setting forth the action taken to comply with

the requirements of Rule U-50 and stating that pursuant to the invitation for competitive bids, the following bids were received:

BOND BIDS

Bidder	Interest rate	Price	Cost of money to the company
	Percent		Percent
Halsey, Stuart & Co., Inc.	3	100.719	2.9636
Kidder, Peabody & Co.	3	100.63	2.9681
Lehman Brothers	3	100.5799	2.9706
The First Boston Corp.	3	100.5599	2.9716
W. C. Langley & Co.	3	100.50	2.9746

PREFERRED STOCK BIDS

Bidder	Dividend rate	Price	Compensation	Cost of money to the company
	Pct.			Pct.
The First Boston Corp.	4.2	101.205	\$2.65	4.2615
Kidder, Peabody & Co.	4.3	101.20	1.64	4.3190
W. C. Langley & Co.	4.3	101.17	1.90	4.3316
Smith, Barney & Co.	4.3	101.15	1.89	4.3320
Lehman Brothers	4.3	101.125	2.00	4.3379

COMBINATION BIDS

Bidder	Interest on dividend rate	Price	Cost of money to the company
	Percent		Percent
The First Boston Corp.: Bonds	3	100.626	2.9683
Preferred stock	4.3	103.614	4.2568
Kidder, Peabody & Co.: Bonds	3	100.78	2.9605
Preferred stock	4.3	101.20	4.3190
W. C. Langley & Co.: Bonds	3	100.70	2.9646
Preferred stock	4.3	101.17	4.3316
Lehman Brothers: Bonds	3	100.7799	2.9605
Preferred stock	4.3	101.125	4.3599

¹ Cost of money to company reflects deduction of compensation.

² Compensation \$2.60 per share.

³ Compensation \$1.64 per share.

⁴ Compensation \$1.90 per share.

⁵ Compensation \$2.50 per share.

It further appearing that West Penn Power has accepted the bond bid of Halsey, Stuart & Co., Inc., and the preferred stock bid of The First Boston Corporation; that the bonds are to be resold to the public at 101.19% of the principal amount thereof, plus accrued interest from March 1, 1948, representing a spread to the underwriters of .471% on said bonds; that the preferred stock is to be sold to the public at the bid price plus accrued dividends from March 1, 1948 and that the commission to the successful bidders for underwriting this stock is \$2.65 per share; and that the subscription price for the new common stock is to be \$25.00 per share which represents a discount from the current market of approximately \$3.00 per share;

The record also having been completed with respect to fees and expenses to be paid by West Penn Power and West Penn Electric in connection with the proposed transactions and the fees and expenses to be borne by the successful bidders,

among these fees being fees to be borne by West Penn Power payable to Sullivan & Cromwell, New York, New York, in the aggregate amount of \$19,500; to Steptoe & Johnson, Clarksburg, West Virginia, of \$750; and to Barnes, Dechert, Price, Smith & Clark, Philadelphia, Pennsylvania, of \$1,000; fees to be borne by West Penn Electric payable to Sullivan & Cromwell, \$500; and to Francis J. Carey, Esquire, Baltimore, Maryland, \$500; and fees of counsel for the successful bidders, Simpson Thacher & Bartlett, New York, New York aggregating \$12,500 of which \$7,500 is applicable to the Bonds and \$5,000 applicable to the preferred stock;

It is ordered, That said joint application-declaration, as amended, be and the same hereby is, granted and permitted to become effective forthwith, subject to the terms and conditions prescribed by Rule U-24 and to the further condition that the reservation of jurisdiction with respect to the payment of fees and expenses applicable to these transactions, and heretofore reserved by the Commission, be, and the same hereby is released.

By the Commission.

[SEAL]

ORVAL L. DuBOIS,
Secretary.

[F. R. Doc. 48-2801; Filed, Mar. 30, 1948;
8:48 a. m.]

[File No. 70-1740]

CITIES SERVICE CO.

ORDER PERMITTING DECLARATION TO BECOME EFFECTIVE

At a regular session of the Securities and Exchange Commission held at its office in the city of Washington, D. C. on the 24th day of March A. D. 1948.

Cities Service Company ("Cities"), a registered holding company, having filed a declaration and amendments thereto pursuant to section 12 (d) of the Public Utility Holding Company Act of 1935 and Rules U-44 and U-50 promulgated thereunder regarding the sale of its entire holdings of common stock of Public Service Company of New Mexico ("Public Service"), consisting of 339,639 shares and representing 64.7% of the total shares of common stock outstanding, pursuant to the competitive bidding requirements of Rule U-50, and the application of the net proceeds of the sale toward the retirement of its outstanding 5% Debentures at the redemption prices thereof; and

Said declaration having been filed on February 9, 1948, and the last amendment thereto having been filed on March 23, 1948, and notice of said filing having been given in the form and manner prescribed by Rule U-23 promulgated pursuant to said act, and the Commission not having received a request for hearing with respect to said declaration within the period specified in said notice, and not having ordered a hearing thereon; and

The Commission finding with respect to said declaration, as amended, that the

proposed sale will comply with the order dated October 12, 1944 requiring Cities to dispose of its interests in the constituent companies which were merged to form Public Service, that there is no basis for adverse findings under the applicable provisions of the act and rules thereunder, and deeming it appropriate in the public interest and in the interest of investors and consumers that said declaration, as amended, be permitted to become effective, and further deeming it appropriate to grant the request of the declarant that the order entered herein become effective forthwith; and

Cities having requested that the Commission's order herein conform to the requirements of section 373 (a), and contain the recitals, specifications and itemizations required by section 1808 (f) of the Internal Revenue Code, as amended:

It is ordered, Pursuant to Rule U-23 and the applicable provisions of the Public Utility Holding Company Act of 1935, that the said declaration, as amended, be, and hereby is, permitted to become effective forthwith subject to the terms and conditions prescribed in Rule U-24 and subject to the further condition that the proposed sale by Cities of its holdings of common stock of Public Service Company of New Mexico shall not be consummated until the results of competitive bidding shall have been made a matter of record in this proceeding and a further order shall have been entered by this Commission in the light of the record so completed, which order may contain such further terms and conditions as may then be deemed appropriate.

It is further ordered, That jurisdiction be, and hereby is, reserved over the payment of all fees and expenses to be incurred in connection with the proposed transactions.

It is further ordered and recited, And the Commission finds that the sale by Cities Service Company of 339,639 shares of common stock of the par value of \$7 per share of Public Service Company of New Mexico is necessary or appropriate to effectuate the provisions of section 11 (b) of the Public Utility Holding Company Act of 1935.

By the Commission.

[SEAL]

ORVAL L. DuBOIS,
Secretary.

[F. R. Doc. 48-2799; Filed, Mar. 30, 1948;
8:48 a. m.]

[File No. 70-1743]

MIDDLE WEST CORP. AND MIDDLE WEST UTILITIES CO. OF CANADA LIMITED

ORDER GRANTING APPLICATION AND PERMITTING DECLARATION TO BECOME EFFECTIVE

At a regular session of the Securities and Exchange Commission held at its office in the city of Washington, D. C., on the 23d day of March A. D. 1948.

The Middle West Corporation ("Middle West"), a registered holding company, and its subsidiary, Middle West Utilities Company of Canada Limited ("Utilities-Limited"), having filed a

joint application-declaration, and an amendment thereto, with this Commission pursuant to the Public Utility Holding Company Act of 1935 ("act") regarding the following proposed transactions:

The application-declaration states that Utilities-Limited, a holding company organized under the laws of the Dominion of Canada and heretofore granted exemption from the provisions of the act which would require it to register as a holding company and from certain provisions of the act applicable to it as a subsidiary of Middle West (see basic exemption order, Holding Company Act Release No. 1554), has changed and reclassified its authorized capital stock by Supplementary Letters Patent, dated January 12, 1948, from 56,600 shares of \$7 cumulative preference stock, \$100 par value per share, and 500,000 shares of common stock without par value to 438,730 shares of common stock without par value.

Middle West, as the owner of all of the outstanding stock of Utilities-Limited, consisting of 6,600 shares of the preference stock and 392,010 shares of the common stock representing paid-up capital of \$3,796,080, proposes to surrender such stock to Utilities-Limited in exchange for 330,740 shares of common stock of Utilities-Limited having a stated value of \$3,796,080 which, after consummation of the proposed transaction, will constitute all of the issued and outstanding capital stock of Utilities-Limited; and

Said application-declaration having been filed on February 10, 1948 and notice of filing having been duly given in the form and manner prescribed by Rule U-23 under said act, and the Commission not having received a request for hearing with respect to said application-declaration within the period specified in said notice, or otherwise, and not having ordered a hearing thereon; and

Applicants-declarants having requested that the Commission's order granting and permitting to become effective said application-declaration become effective forthwith upon issuance; and

The Commission finding with respect to said application-declaration, as amended, that the applicable provisions of the act and rules and regulations and orders thereunder have been satisfied and that there is no basis for adverse findings and deeming it appropriate in the public interest and in the interest of investors and consumers to grant and permit to become effective said application-declaration and to grant the request of the applicants-declarants:

It is ordered, Pursuant to Rule U-23 and the applicable provisions of the act and subject to the terms and conditions prescribed in Rule U-24, that said application-declaration, as amended, be, and hereby is, granted and permitted to become effective forthwith.

By the Commission.

[SEAL]

ORVAL L. DuBOIS,
Secretary.

[F. R. Doc. 48-2802; Filed, Mar. 30, 1948;
8:48 a. m.]

[File No. 70-1744]

KANSAS GAS AND ELECTRIC CO.

SUPPLEMENTAL ORDER RELEASING JURISDICTION AND GRANTING AND PERMITTING APPLICATION - DECLARATION TO BECOME EFFECTIVE

At a regular session of the Securities and Exchange Commission, held in its office in the city of Washington, D. C., on the 23d day of March A. D. 1948.

Kansas Gas and Electric Company ("Kansas"), an electric subsidiary of American Power & Light Company, a registered holding company subsidiary of Electric Bond and Share Company, also a registered holding company, having filed an application-declaration, and amendments thereto, pursuant to sections 6 (a) and 7 of the Public Utility Holding Company Act of 1935, and Rule U-50 thereunder, regarding the issue and sale at competitive bidding of \$5,000,000 principal amount of its First Mortgage Bonds, --% Series, due 1978 ("Bonds"); and

The Commission having by order dated March 10, 1948, granted and permitted to become effective said application-declaration, as amended, subject to the condition that the proposed issue and sale of said Bonds not be consummated until the results of competitive bidding, pursuant to Rule U-50, had been made a matter of record in this proceeding, and a further order entered by the Commission in light of the record as so completed and subject to a further reservation of jurisdiction with respect to the payment of all fees and expenses in connection with the proposed transactions; and

Kansas having filed a further amendment to its application-declaration setting forth the action taken to comply with the requirements of Rule U-50 and stating that pursuant to an invitation for competitive bids, seven bids for said Bonds by seven groups of underwriters headed by the firms set forth below were received:

Underwriting group	Coupon rate	Price to company	Cost to company
	Per-		Per-
	cent		cent
Halsey, Stuart & Co., Inc.	3 3/4	\$100.7199	3.088
Merrill Lynch, Pierce, Fenner & Beane	3 3/4	100.439	3.1024
Harriman Ripley & Co., Inc.	3 3/4	100.172	3.1161
Lehman Brothers	3 3/4	100.1421	3.1177
W. C. Langley & Co.	3 3/4	100.1099	3.1193
Blyth & Co., Inc.	3 3/4	100.07	3.1214
Salomon Bros. & Hutzler	3 3/4	102.4567	3.1232

Said amendment to the application-declaration having contained the statement that Kansas has accepted the bid of the group headed by Halsey, Stuart & Co., Inc., as set out above, and that the bonds will be offered for sale to the public at a price of 101.25% of the principal amount thereof resulting in an underwriters' spread of 0.53% per unit or a total underwriters' spread of \$26,505; and

The Commission finding that the proposed payment of counsel fees in the amount of \$6,000 to Reid & Priest, New

York counsel for Kansas, \$5,000 to Caldwell, Downing, Noble & Garrity, local counsel for Kansas, and \$6,000 to Le-Boeuf & Lamb, counsel for the successful bidders for said bonds, whose fee is to be paid by the successful bidder, are not unreasonable; and

The Commission having examined said amendment and having considered the record herein and finding no reason for imposing terms and conditions with respect to said matters:

It is ordered, That jurisdiction heretofore reserved with respect to the matters to be determined as a result of competitive bidding for said bonds under Rule U-50 be, and the same hereby is, released and that the amendment filed on March 25, 1948, to the application-declaration be, and the same hereby is, granted and permitted to become effective, forthwith, subject, however, to the terms and conditions prescribed in Rule U-24.

It is further ordered, That jurisdiction heretofore reserved with respect to fees and expenses of counsel in connection with the issue and sale of said bonds, including fees payable to counsel for the successful bidder, be, and the same hereby is, released.

By the Commission.

[SEAL]

ORVAL L. DuBOIS,
Secretary.

[F. R. Doc. 48-2805; Filed, Mar. 30, 1948;
8:52 a. m.]

[File No. 70-1762]

QUEENS BOROUGH GAS AND ELECTRIC CO.

ORDER PERMITTING DECLARATION TO BECOME EFFECTIVE

At a regular session of the Securities and Exchange Commission, held at its office in the city of Washington, D. C., on the 23d day of March 1948.

Queens Borough Gas and Electric Company, a subsidiary of Long Island Lighting Company, a registered holding company, having filed a declaration, as amended, pursuant to sections 6 and 7 of the Public Utility Holding Company Act of 1935 ("act"), with respect to the following transaction:

Declarant proposes to issue and sell for cash at principal amount to the Bank of the Manhattan Company an unsecured promissory note in the principal amount of \$300,000 which will bear interest at the rate of 2 1/4% per annum and mature November 26, 1948. The proceeds of the sale of the note are to be used to pay a note in the same principal amount due March 24, 1948 and held by the Bank of the Manhattan Company.

Such declaration, as amended, having been duly filed, and notice of said filing having been duly given in the form and manner prescribed by Rule U-23 promulgated pursuant to said act, and the Commission not having received a request for hearing with respect to said declaration, as amended, within the period specified in said notice, or otherwise, and not having ordered a hearing thereon; and

The Commission finding that no adverse findings are necessary with respect to the declaration, as amended, and deeming it appropriate in the public interest and in the interests of investors and consumers that said declaration, as amended, be permitted to become effective, and deeming it appropriate to grant the request of declarant that the order become effective at the earliest date possible:

It is hereby ordered, Pursuant to Rule U-23 and the applicable provisions of the act and subject to the terms and conditions prescribed in Rule U-24, that the declaration, as amended, be, and the same hereby is, permitted to become effective forthwith.

By the Commission.

[SEAL]

ORVAL L. DuBOIS,
Secretary.

[F. R. Doc. 48-2803; Filed, Mar. 30, 1948;
8:49 a. m.]

DEPARTMENT OF JUSTICE

Office of Alien Property

AUTHORITY: 40 Stat. 411, 55 Stat. 839, Pub. Laws 322, 671, 79th Cong., 60 Stat. 50, 925; 50 U. S. C. and Supp. App. 1, 616; E. O. 9193, July 6, 1942, 3 CFR, Cum. Supp., E. O. 9567, June 8, 1945, 3 CFR, 1945 Supp., E. O. 9788, Oct. 14, 1946, 11 F. R. 11981.

[Vesting Order 10855]

GISELA WOLF

In re: Stocks, bonds, scrip certificate and bank account owned by Gisela Wolf. F-28-6217-A-1, F-28-6217-D-1, F-28-6217-E-1.

Under the authority of the Trading With the Enemy Act, as amended, Executive Order 9193, as amended, and Executive Order 9788, and pursuant to law, after investigation, it is hereby found:

1. That Gisela Wolf, whose last known address is Bergstrasse 59, Heidelberg, Germany, is a resident of Germany and a national of a designated enemy country (Germany);

2. That the property described as follows:

a. Those certain shares of stock described in Exhibit A, attached hereto and by reference made a part hereof, presently in the custody of The National City Bank of New York, 55 Wall Street, New York, New York, together with all declared and unpaid dividends thereon,

b. One (1) The New York, New Haven & Hartford Railroad Company first and refunding mortgage 4% bond, Series A, due July 1, 2007, of \$1000 face value, bearing number 62581, issued in the name of bearer and presently in the custody of The National City Bank of New York, 55 Wall Street, New York, New York, together with all rights thereunder and thereto,

c. One (1) bearer scrip certificate, of \$5.41 face value and numbered 8558, for The New York, New Haven & Hartford Railroad Company first and refunding mortgage 4% bonds, Series A, due July 1, 2007, presently in the custody of The National City Bank of New York, 55 Wall Street, New York, New York, together with all rights thereunder and thereto,

d. Two (2) Spokane International Railway Company 1st mortgage 50 year 5% bonds, due July 1, 1955, of \$1000 face value each, bearing numbers 465 and 489, issued in the name of bearer and presently in the custody of The National City Bank of New York, 55 Wall Street, New York, New York, together with all rights thereunder and thereto, including particularly but not limited to all rights created thereunder by virtue of a plan of reorganization of said Spokane International Railway Company consummated on October 1, 1941, and

e. That certain debt or other obligation owing to Gisela Wolf by The National City Bank, 55 Wall Street, New York, New York, arising out of a clean credit deposit account entitled Mrs. Gisela Wolf, and any and all rights to demand, enforce and collect the same,

is property within the United States owned or controlled by, payable or deliverable to, held on behalf of or on account of, or owing to, or which is evidence of ownership or control by, the aforesaid national of a designated enemy country (Germany).

and it is hereby determined:

EXHIBIT A

Name and address and State of incorporation of issuer	Description of stock	Number of shares	Certificate No.	Name in which registered
Chicago & Eastern Illinois Ry. Co., Chicago, Ill., an Illinois corporation.	\$100 par value common stock.	4	05223	Mrs. Gisela Wolf (in bearer form).
The Chesapeake & Ohio Ry. Co., Richmond, Va., a Virginia corporation.	\$100 par value 3½ percent convertible preferred stock.	50/100	CS136	
	\$25 par value common stock.	5	2979	
The New York, Chicago & St. Louis R. R. Co., Cleveland, Ohio, incorporated under the laws of Ohio, New York, Pennsylvania, Indiana, and Illinois.	\$100 par value common stock.	60/100	114	Do.
	\$100 par value common stock.	4	451021	
	\$100 par value common stock.	30/100	1174	
		3/40	85319	(In bearer form).
		1/40	66963	

[F. R. Doc. 48-2860; Filed, Mar. 30, 1948; 8:57 a. m.]

[Vesting Order 10895]

NIKOLAUS CARL RIMBACH

In re: Estate of Nikolaus Carl Rimbach, deceased. File D-28-11051; E. T. sec. 15489.

Under the authority of the Trading With the Enemy Act, as amended, Executive Order 9193, as amended, and Executive Order 9788, and pursuant to law, after investigation, it is hereby found:

1. That Caspar Ludwig Carl Nolker, Wilhelm Ernst Nolker, Heinrich Friedrich Nolker and Anna Krockner, nee Krell, whose last known address is Germany, are residents of Germany and nationals of a designated enemy country (Germany);

2. That the descendants, names unknown, of Anna Nolker and of Elise Krell, who there is reasonable cause to believe are residents of Germany, are nationals of a designated enemy country (Germany);

3. That all right, title, interest and claim of any kind or character whatsoever of the persons identified in subparagraphs 1 and 2 hereof, and each of them, in and to the estate of Nikolaus Carl Rimbach, deceased, is property payable or deliverable to, or claimed by, the

3. That to the extent that the person named in subparagraph 1 hereof is not within a designated enemy country, the national interest of the United States requires that such person be treated as a national of a designated enemy country (Germany).

All determinations and all action required by law, including appropriate consultation and certification, having been made and taken, and, it being deemed necessary in the national interest,

There is hereby vested in the Attorney General of the United States the property described above, to be held, used, administered, liquidated, sold or otherwise dealt with in the interest of and for the benefit of the United States.

The terms "national" and "designated enemy country" as used herein shall have the meanings prescribed in section 10 of Executive Order 9193, as amended.

Executed at Washington, D. C., on March 5, 1948.

For the Attorney General.

[SEAL]

DAVID L. BAZELON,
Assistant Attorney General,
Director, Office of Alien Property.

aforesaid nationals of a designated enemy country (Germany);

4. That such property is in the process of administration by Adolf Binz, as executor, acting under the judicial supervision of the Probate Court of the County of St. Louis, Missouri;

and it is hereby determined:

5. That to the extent that the persons named in subparagraph 1 hereof and the descendants, names unknown, of Anna Nolker and of Elise Krell, are not within a designated enemy country, the national interest of the United States requires that such persons be treated as nationals of a designated enemy country (Germany).

All determinations and all action required by law, including appropriate consultation and certification, having been made and taken, and, it being deemed necessary in the national interest,

There is hereby vested in the Attorney General of the United States the property described above, to be held, used, administered, liquidated, sold or otherwise dealt with in the interest of and for the benefit of the United States.

The terms "national" and "designated enemy country" as used herein shall have

the meanings prescribed in section 10 of Executive Order 9193, as amended.

Executed at Washington, D. C., on March 15, 1948.

For the Attorney General.

[SEAL] HAROLD I. BAYNTON,
Deputy Director,
Office of Alien Property.

[F. R. Doc. 48-2861; Filed, Mar. 30, 1948;
8:57 a. m.]

[Vesting Order 10916]

ANNA BOHNET

In re: Estate of Anna Bohnet, deceased. File No. D-28-4298, E. T. sec. 7325.

Under the authority of the Trading With the Enemy Act, as amended, Executive Order 9193, as amended, and Executive Order 9788, and pursuant to law, after investigation, it is hereby found:

1. That Emilie Bieder, Louise Eberle, Christine Birk, Karl Bohnet, Emil Bohnet, Werner Gustav Bohnet, Johannes Bohnet, Anna Bohnet, Ernest Meidele, Anna Meidele, Barbara Miller, Karl Leopold, Gottlob Leopold and Katherine Woessmer, whose last known address is Germany, are residents of Germany and nationals of a designated enemy country (Germany);

2. That all right, title, interest and claim of any kind or character whatsoever of the persons named in subparagraph 1 hereof in and to the estate of Anna Bohnet, deceased, is property payable or deliverable to, or claimed by, the aforesaid nationals of a designated enemy country (Germany);

3. That such property is in the process of administration by Florence Tucciarone, as Executrix, acting under the judicial supervision of the Surrogate's Court of Kings County, New York;

and it is hereby determined:

4. That to the extent that the persons named in subparagraph 1 hereof are not within a designated enemy country, the national interest of the United States requires that such persons be treated as nationals of a designated enemy country (Germany).

All determinations and all action required by law, including appropriate consultation and certification, having been made and taken, and, it being deemed necessary in the national interest,

There is hereby vested in the Attorney General of the United States the property described above, to be held, used, administered, liquidated, sold or otherwise dealt with in the interest of and for the benefit of the United States.

The terms "national" and "designated enemy country" as used herein shall have the meanings prescribed in section 10 of Executive Order 9193, as amended.

Executed at Washington, D. C., on March 19, 1948.

For the Attorney General.

[SEAL] HAROLD I. BAYNTON,
Deputy Director,
Office of Alien Property.

[F. R. Doc. 48-2862; Filed, Mar. 30, 1948;
8:57 a. m.]

[Return Order 100]

BISHOP NATIONAL BANK OF HAWAII

Having considered the claim set forth below and having issued a Determination allowing the claim, which is incorporated by reference herein and filed herewith,

Claimant and claim No.	Notice of intention to return published	Property
Bishop National Bank of Hawaii at Honolulu, Honolulu, T. H. Claim No. 6491.	Feb. 17, 1948 (13 F. R. 730).	\$18,294.94 in the Treasury of the United States. All right, title and interest of the Attorney General in and to a balance of \$1,920.73 in the Bishop National Bank of Hawaii at Honolulu in an account designated as "Hiyama Shoten, Cash Letter of Deposit Account."

Appropriate documents and papers effectuating this order will issue.

Executed at Washington, D. C., on March 24, 1948.

For the Attorney General.

[SEAL] HAROLD I. BAYNTON,
Deputy Director,
Office of Alien Property.

[F. R. Doc. 48-2865; Filed, Mar. 30, 1948;
8:57 a. m.]

[Vesting Order 10931]

MARGARET C. THOME ET AL.

In re: Margaret C. Thome, individually, and as substituted trustee, vs. Magdalena Thiel et als. File D-28-12015; E. T. sec. 16222.

Under the authority of the Trading With the Enemy Act, as amended, Executive Order 9193, as amended, and Executive Order 9788, and pursuant to law, after investigation, it is hereby found:

1. That Magdalena Thiel, Margarethe Lambert, Albert Leist, Alois Leist, Jakob Leist, Reinhold Leist, Maria Hans, Johann Leist, Berta Leist, Willi Leist, Josef Leist, Maria Recktenwald, Friederick Leist, Johanna Leist, Jakob Leist, Ida Eckert, Maria Engel, Barbara Schmidt, Theodore Leist, Berta Klein, Johanna Kramer, Emma Kreuz, Elisabeth Thurnes, Mrs. John Gard, whose last known address is Germany, are residents of Germany and nationals of a designated enemy country (Germany);

2. That the heirs, names unknown, of Elisabeth Thurnes, Jakob Leist, Heinrich Leist, Catherine Leist, Peter Leist, Nicholas Leist, Stephen Leist and Jacob Leist, who there is reasonable cause to believe are residents of Germany, are nationals of a designated enemy country (Germany);

3. That all right, title, interest and claim of any kind or character whatsoever of the persons identified in subparagraphs 1 and 2 hereof, and each of them, in and to the trust created under the will and codicil of Barbara Thome, deceased, is property payable or deliverable to, or claimed by, the aforesaid nationals of a designated enemy country (Germany);

4. That such property is in the process of administration by Margaret C. Thome

It is ordered, That the claimed property, described below and in the determination, be returned, subject to any increase or decrease resulting from the administration thereof prior to return, and after adequate provision for taxes and conservatory expenses:

as Substituted Trustee, acting under the judicial supervision of the Circuit Court No. 2 of Baltimore City, Baltimore, Maryland;

and it is hereby determined:

5. That to the extent that the persons named in sub-paragraph 1 hereof, and the heirs, names unknown of Elizabeth Thurnes, Jakob Leist, Heinrich Leist, Catherine Leist, Peter Leist, Nicholas Leist, Stephen Leist and Jacob Leist, are not within a designated enemy country, the national interest of the United States requires that such persons be treated as nationals of a designated enemy country (Germany).

All determinations and all action required by law, including appropriate consultation and certification, having been made and taken, and, it being deemed necessary in the national interest,

There is hereby vested in the Attorney General of the United States the property described above, to be held, used, administered, liquidated, sold or otherwise dealt with in the interest of and for the benefit of the United States.

The terms "national" and "designated enemy country" as used herein shall have the meanings prescribed in section 10 of Executive Order 9193, as amended.

Executed at Washington, D. C., on March 24, 1948.

For the Attorney General.

[SEAL] HAROLD I. BAYNTON,
Deputy Director,
Office of Alien Property.

[F. R. Doc. 48-2863; Filed, Mar. 30, 1948;
8:57 a. m.]

[Return Order 101]

HAIM CAPELLUTO

Having considered the claim set forth below and having issued a determination allowing the claim, which is incorporated by reference herein and filed herewith,

It is ordered, That the claimed property, described below and in the determination, be returned, subject to any increase or decrease resulting from the administration thereof prior to return, and after adequate provision for taxes and conservatory expenses:

Claimant and claim No.	Notice of intention to return published	Property
Haim Capelluto, Claim No. 4602----	Feb. 18, 1948 (13 F. R. 742).	\$13,976.69 in the Treasury of the United States.

Appropriate documents and papers effectuating this order will issue.

Executed at Washington, D. C., on March 24, 1948.

For the Attorney General.

[SEAL] HAROLD I. BAYNTON,
Deputy Director,
Office of Alien Property.

[F. R. Doc. 48-2866; Filed, Mar. 30, 1948;
8:58 a. m.]

HARUNO YASUI ET AL.

NOTICE OF INTENTION TO RETURN VESTED PROPERTY

Pursuant to section 32 (f) of the Trading With the Enemy Act, as amended, notice is hereby given of intention to return, on or after 30 days from the date of publication hereof the following property, located in the Treasury of the United States, Washington, D. C., subject to any increase or decrease resulting from the administration of such property prior to return and after adequate provision for taxes and conservatory expenses:

Claimant	Claim No.	Property
Haruno Yasui, 3449 Kaau St., Honolulu, T. H.	7400	\$588.77
Takejiro Yawata, 444 McNeill St., Honolulu, T. H.	7401	40.29
Tomitaro Yawata, 444 McNeill St., Honolulu, T. H.	7402	13.19
Hisaye Yokomiro, Queen's Hospital, Honolulu, T. H.	7403	1,120.02
Sakichi Yoshimoto, 1812 Lakapu St., Honolulu, T. H.	7406	24.36
Junzo Yoshimura, Aiea, Oahu, T. H.	7407	83.21
Ryuichi Yoshimura, 1458 Kinau St., Honolulu, T. H.	7409	67.83
Yasuji Akahoshi, 3002-A Waiiale Ave., Honolulu 36, T. H.	7569	2,221.32
Toyo Akita, guardian of Shizuno Akita, 1931 Aupuni St., Honolulu, T. H.	7571	12.13
Toyo Akita, guardian of Yoshiko Akita, 1931 Aupuni St., Honolulu, T. H.	7573	33.15
Kanejiro Aono 2030 Homerule St., (now 2014 Homerule), Honolulu, T. H.	7575	670.86
Sana Arai, Post Office Box 211, Aiea, Oahu, T. H.	7576	256.43
Seiya Aramaki, 1960 Young St., Honolulu, T. H.	7579	204.02
Mrs. Kazue Fujii (per I. Fujii), 1041 Seventh Ave., Honolulu 47, Hawaii.	7581	249.71
Torabei Fujii, 38 Hialoa St., Honolulu, T. H.	7582	17.64
Tomioy Fujikawa, 1114 Desha Lane, Honolulu, T. H.	7584	45.17
Itsuo Fujita, 1804 Lusitana St., Honolulu, T. H.	7585	175.98

Claimant	Claim No.	Property
Eizo Fukuda, 1306 Kopokoki Rd., Honolulu 49, T. H.	7588	\$31.08
Koichi, Fukuoka or Mrs. Kimie Fukuoka, 1951 Fort St., Honolulu 23, Hawaii.	7591	2,242.03
Gishu Goya, 1436 Niihpu Pl., Honolulu, T. H.	7594	162.86
Kichiro Hanzawa, c/o Lelehi Hospital, Honolulu 26, T. H.	7595	121.71
Sakaye Harano, 721 Paani St., Honolulu, T. H.	7596	518.79
Masuta Heisen, 1436 10th Ave., Honolulu, T. H.	7598	552.93
Mr. Sukezuchi Higuchi, Pearl City, Oahu, T. H.	7602	6.86
Mr. Rikichi Hiraki, trustee for Shigeo Hiraki, 404 North School St., Honolulu, T. H.	7603	43.51
Mr. Tame Kiraoka, 2230 Citron St., Honolulu, T. H.	7604	223.28
Mrs. Tomi Hirata (formerly Tomi Fukuda), 832 South Hotel St., Honolulu 53, T. H.	7605	11.05
Mr. Mika Hironaka, 912 22d Ave., Honolulu, T. H.	7606	220.44
Mr. Masayo Hirose, 2827-B Waiiale Ave., Honolulu, T. H.	7607	191.56
Mr. Hatsumo Horikami, 4210 Amann Pl., Honolulu, T. H.	7611	185.33
Mr. Kikuno Igawa or Shizuo Igawa, 927-B Hauston St., Honolulu 36, T. H.	7613	25.31
Mr. Masaru Ikeda, 3218 Castle St., Honolulu, T. H.	7614	204.94
G. Imanaka, trustee for Hidenori Imanaka, 3544 Aloha Ave., Honolulu, T. H.	7616	11.43
Isamu Iwanaga, Kaimi Farm, P. O. Box 189, Lanikai, T. H.	7618	24.86
Kane Iwaoka, guardian of Ginichi Iwaoka, 712 Halakauwila St., Honolulu, T. H.	7619	827.99
Koyata Ibaraki, 2500 Kalakaua Ave., Honolulu 30, T. H.	7620	1,512.20
Sawano Iwata, 415-B Waiakamilo Rd., Honolulu, T. H.	7621	26.29
Kame Kagami, guardian of Fusao Kagami, 1424 Kaunualii St., Honolulu 35, T. H.	7622	165.48
Mr. Yoshitaro Kaku, 4664 Farmers Rd., Honolulu, T. H.	7623	515.72
Genichi Ken, 945-A South Queen St., Honolulu, T. H.	7624	101.62
Mr. Kumeshiro Kanda, 1131 Hoolai St., Honolulu, T. H.	7625	51.25
Shinkichi Kashiwagi, c/o Shizuo Kashiwagi, 1719-A Nuuanu Ave., Honolulu, T. H.	7628	360.67
Riyoichi Katsuhira, C. P. C. Pomo-ho, Whaiawa, Oahu, T. H.	7630	1,065.44
Gonzo Kiryu or Noj Kiryu, P. O. Box 211, Aiea, Oahu, T. H.	7635	1,250.34
Noriju Koga P. O. Box 545, Waiiale, Oahu, T. H.	7636	27.95
Mrs. Tamae Kubota, P. O. Box 192, Aiea, Oahu, T. H.	7638	569.21
Mr. Kanji Maeda, 243 North King St., Honolulu, T. H.	7640	12.13
Mrs. Kura Masatsugu, P. O. Box 501, Waiiale, Oahu, T. H.	7642	1,457.41
Moritaro Matsubara, 902-B Kahika Lane, Honolulu, T. H.	7644	135.33
Tokuju Matsushita, 1025 Long Lane, Honolulu, T. H.	7648	307.13
Mrs. Betty Tamie Miyamura (nee Tamie Kawabata) 336-A Aku St., Honolulu, T. H.	7650	174.79
Mr. Yoshio Miyashiro or Natsue Moriguchi, 2826-C Kamehameha Highway, Honolulu, T. H.	7652	212.63

Claimant	Claim No.	Property
Mr. Shotaro Moriguchi or Natsue Moriguchi, 2826-C Kamehameha Highway, Honolulu, T. H.	7653	\$2,047.71
Mr. Shotaro Moriguchi, 2826-C Kamehameha Highway, Honolulu, T. H.	7654	158.34
Mr. Naoyo Murakami, 776 Funahou St., Honolulu, T. H.	7656	9.57
Mr. Mika Nakashige, 444 One Lane, Honolulu, T. H.	7659	2,834.2
Mr. Ken Nishita or Kikuyo Nishita, 2719 Nakookoo St., Honolulu 36, T. H.	7661	205.69
Mrs. Kikuyo Nishita, 2719 Nakookoo St., Honolulu 36, T. H.	7662	30.44
Kaju Jinnai, formerly Kaji Iwamoto, 1007 Alewa Dr., Honolulu, T. H.	7640	202.92

Executed at Washington, D. C., on March 26, 1948.

For the Attorney General.

[SEAL] HAROLD I. BAYNTON,
Deputy Director,
Office of Alien Property.

[F. R. Doc. 48-2867; Filed, Mar. 30, 1948;
8:58 a. m.]

[Vesting Order 10369, Amdt.]

ELLEN BOLLMANN ET AL.

In re: Stock owned by Ellen Bollmann and others.

Vesting Order 10369, dated December 19, 1947, is hereby amended as follows and not otherwise:

By deleting from subparagraph 7a of said Vesting Order 10369, the words, "Twenty (20) shares of \$50.00 par value preferred capital" and substituting therefor the words, "Twenty (20) shares of no par value common."

All other provisions of said Vesting Order 10369 and all actions taken by or on behalf of the Attorney General of the United States in reliance thereon, pursuant thereto and under the authority thereof are hereby ratified and confirmed.

Executed at Washington, D. C., on March 19, 1948.

For the Attorney General.

[SEAL] HAROLD I. BAYNTON,
Deputy Director,
Office of Alien Property.

[F. R. Doc. 48-2864; Filed, Mar. 30, 1948;
8:57 a. m.]